


AS-506

DBR
ITEM NO.
50



MISSION SUPPLEMENTS TO NETWORK OPERATIONS DIRECTIVE

JUNE, 1969



For —

NASA MANNED SPACE FLIGHT OPERATIONS

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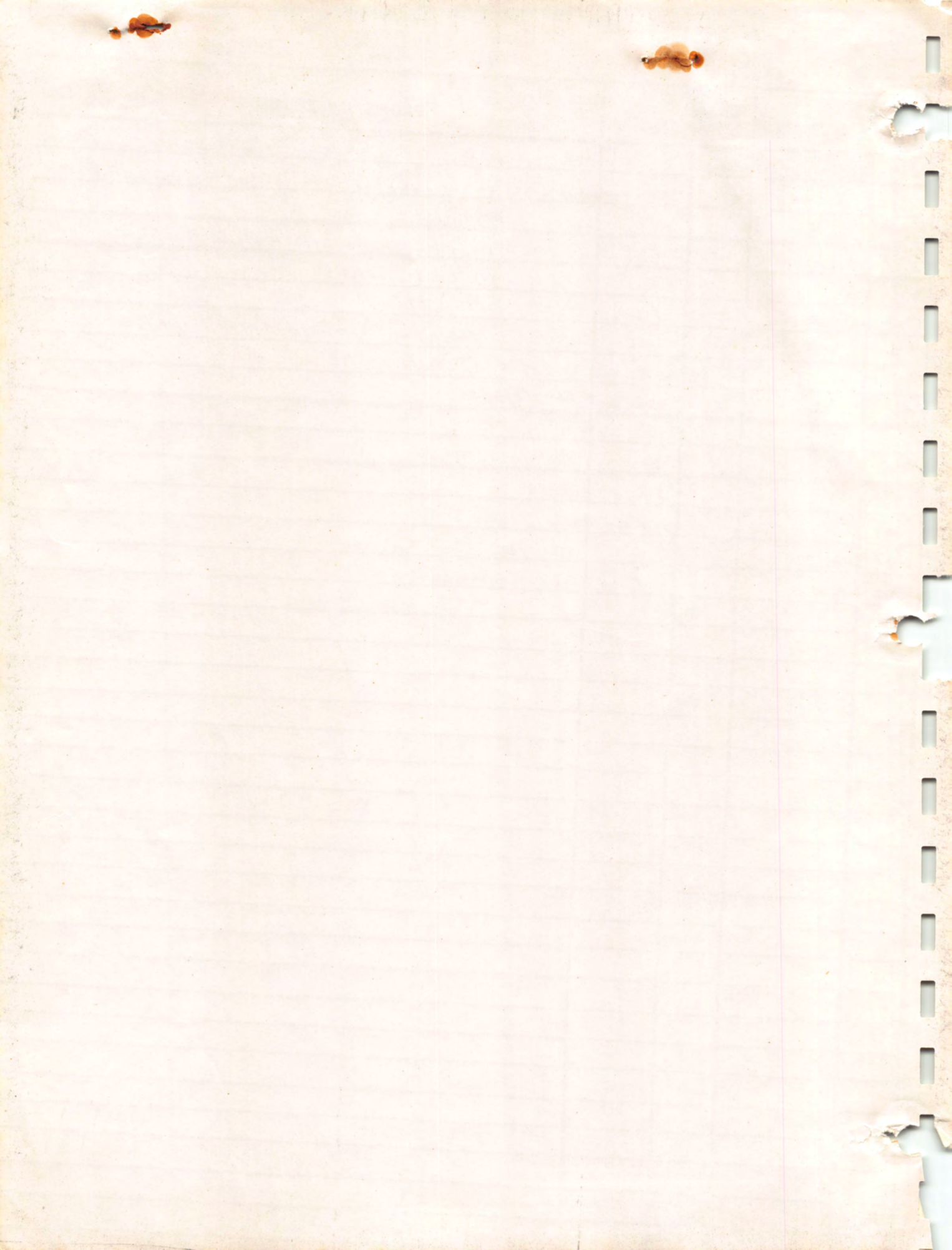
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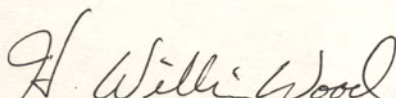


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for
NASA MANNED SPACE FLIGHT OPERATIONS

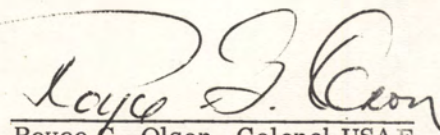
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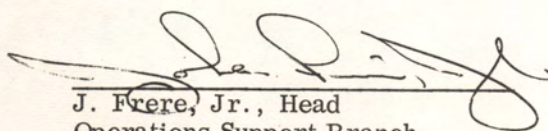
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H. William Wood, Head
Manned Flight Operations Division
Goddard Space Flight Center

Date: May 21, 1969


Royce G. Olson, Colonel USAF
DOD Manned Spacecraft
Support Office (DDMS)

Date: May 7, 1969


J. Frere, Jr., Head
Operations Support Branch
Manned Spacecraft Center

Date: May 7, 1969

PDC/ISI CHECK LIST

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PREFACE

This publication supplements the Network Operations Directive (NOD), Change 3 to Revision 2, dated April 17, 1969 and contains information and instructions applicable to the AS-506 Mission. It was prepared by the Manned Flight Operations Division (MFOD), Goddard Space Flight Center, in response to the following requirement documents:

APOLLO SATURN V PROGRAM SUPPORT REQUIREMENTS DOCUMENT (PSRD), through Revision 15 dated April 30, 1969.

AS-505 DATA ACQUISITION PLAN (DAP), Revision 1 dated April 4, 1969.

Annex B - Telemetry Data Format Control Handbook, Revision 2, dated April 15, 1969.

Annex C - Command Data Format Control Handbook, Revision 4, dated March 21, 1969.

Annex D - Tracking Data Format Control Handbook, Revision 2, dated March 1969.

Annex E - Remote Site Data Processor Programming Requirements, Volume 1, Change 2 to Revision 1, dated January 1969. Volume 2, Change 1 to Revision 1, dated January 15, 1969.

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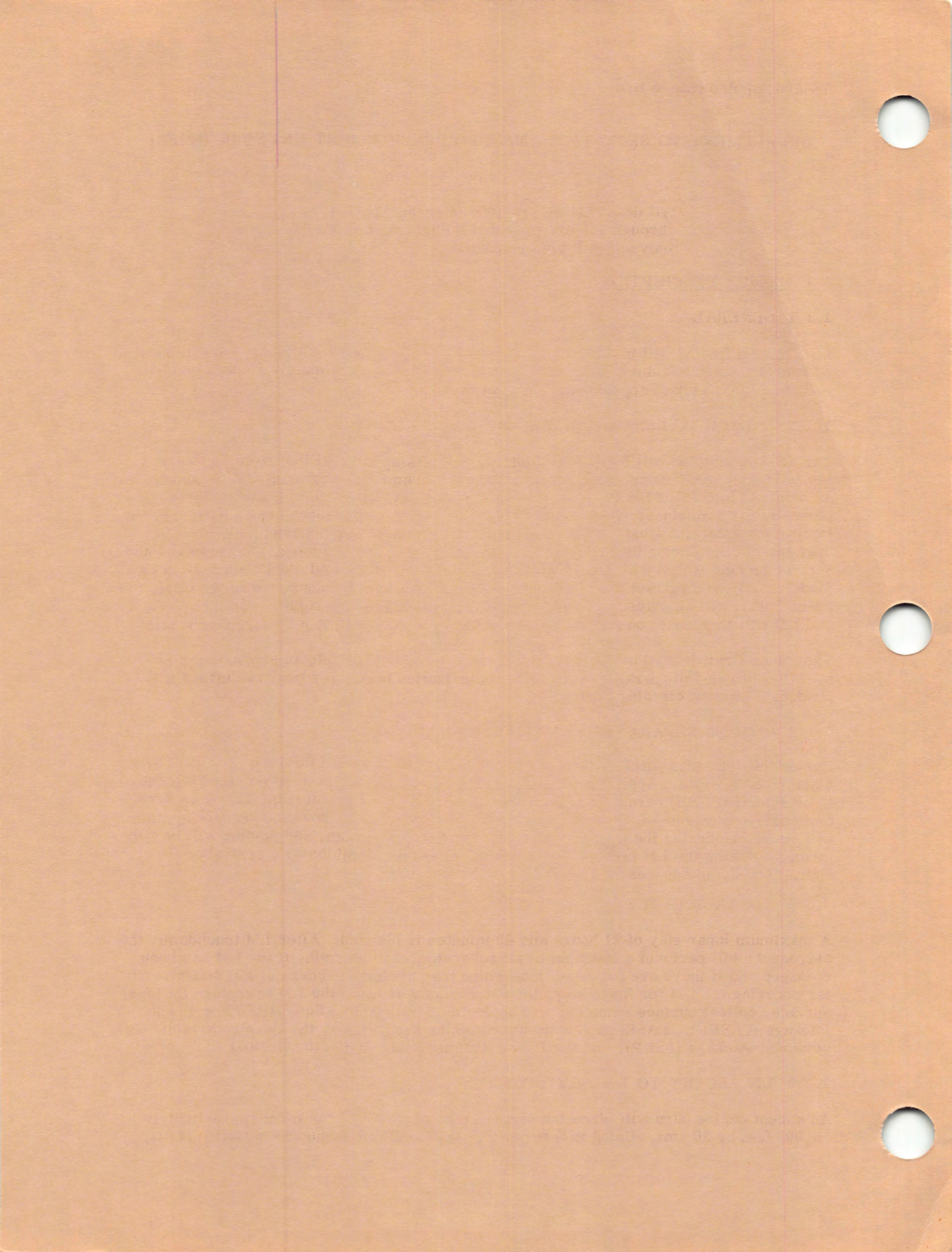
PART I
MANAGEMENT PLAN

NOTE

Sections 2 and 3 require no supplementary information for the AS-506 mission (See the NOD).

Supplement to Section 1

MSFN



SUPPLEMENT TO SECTION 1. MANNED SPACE FLIGHT NETWORK (MSFN)

Note

All descriptions provided in paragraph 1.1 through 1.5 are provided for information only and will not be updated.

1.1 MISSION DESCRIPTION

1.1.1 GENERAL

AS-506, Apollo 11, will be the first manned Apollo lunar landing mission. S/C to be used will include CSM 107 and LM-5. The mission will last approximately 10 days and will include a lunar stay of approximately 22 hours.

1.1.2 LAUNCH TO LUNAR PARKING ORBIT

The AS-506 mission will be launched into Earth Parking Orbit (EPO) from the Merritt Island launch area, complex 39. This will be a 100 nmi circular orbit with a launch azimuth of from 72 to 108 degrees, depending upon date and time of launch. First opportunity for Translunar Injection (TLI) will occur during the second revolution over the Pacific for a July, August, or September launch. The second opportunity will occur over the Pacific during the third revolution. Following the TLI burn, the Command and Service Module (CSM) will separate from the S-IVB; turn around; dock with the Lunar Module (LM); and extract the LM from the S-IVB. To avoid recontact with the CSM, the spent S-IVB will be placed in a solar orbit by a "slingshot" exercise. The docked CSM and LM will then coast on a free return trajectory until the first midcourse correction.

The Lunar Orbit Insertion (LOI) burn will place the CSM/LM into an approximate 60-by-170-nautical-mile parking orbit. A circularization burn after two revolutions will produce a 60-nmi circular orbit.

1.1.3 LM/CSM SEPARATION TO LUNAR LANDING

During the 10th orbit after the circularization burn, the LM and CSM will separate by a distance of 2.9 nmi. Approximately one-half revolution after separation, the Descent Orbit Injection (DOI) burn will occur, placing the LM in a descent orbit having an 8.23-nmi pericyynthion and 58.1-nmi apocynthion. At pericyynthion, powered descent ignition will occur, beginning the powered descent. Braking, approach, and landing will be performed, placing the LM on the lunar surface west of pericyynthion by a central angle of approximately 15 degrees.

1.1.4 LUNAR SURFACE OPERATION

A maximum lunar stay of 21 hours and 40 minutes is planned. After LM touchdown, the astronauts will perform a checkout of all subsystems to determine if the LM has been damaged and if there are any conditions which may hinder a successful LM ascent. After securing the LM for lunar stay, the astronauts will leave the LM to explore the lunar surface, collect surface samples, and deploy the Early Apollo Scientific Experiment Package (EASEP). EASEP will contain two major subsystems, the Passive Seismic Experiment Package (PSEP), and the Laser Ranging Retro-Reflector (LRRR).

1.1.5 LM ASCENT TO LM/CSM DOCKING

An ascent engine burn will place the ascent stage of the LM in an orbit approximately 55,000 feet by 30 nmi. Using RCS thrusting, the Coelliptic Sequence Initiation (CSI),

Constant Delta H (CDH), Terminal Phase Initiation (TPI), and Terminal Phase Finalization (TPF) maneuvers will be performed to bring the LM within docking range of the CSM. After docking and crew and equipment transfer, the LM will be jettisoned in lunar orbit.

1.1.6 TRANSEARTH INJECTION (TEI) TO RECOVERY

The TEI burn will occur on the far side of the moon, placing the CSM in a transearth coast which will last approximately 63 hours. Prior to entry interface (400,000 feet) the SM will be jettisoned. The CM, suspended on the main parachutes, will reach splashdown 14 minutes and 6 seconds after entry interface.

1.2 MISSION OBJECTIVES

1.2.1 GENERAL

The primary objectives of this mission are to perform a manned lunar landing; selenological inspection, survey, and sampling; and safe return.

1.2.2 DETAILED TEST OBJECTIVES

- a. Contingency sample collection
- b. Lunar surface EVA operations
- c. EMU lunar surface operations
- d. Television coverage
- e. Landing effects on LM
- f. Landing surface characteristics
- g. Bulk sample collection
- h. Landed LM location
- i. Lunar environment visibility
- j. Assessment of contamination by lunar material
- k. Experiment S-031, Early Apollo Experiments Package (EASEP)
- l. Experiment S-078, laser ranging retro-reflector
- m. Experiment S-078, laser ranging retro-reflector
- n. Documented sample collection
- o. Lunar surface structure photography

1.3 ALSEP/EASEP SUPPORT

Refer to Annex C of the NOD for EASEP support procedures during mission and non-mission periods.

1.4 FREQUENCY ASSIGNMENTS

Refer to figures 1-1 and 1-2 for frequencies assigned in the AS-506 mission.

1.5 NETWORK CONFIGURATION

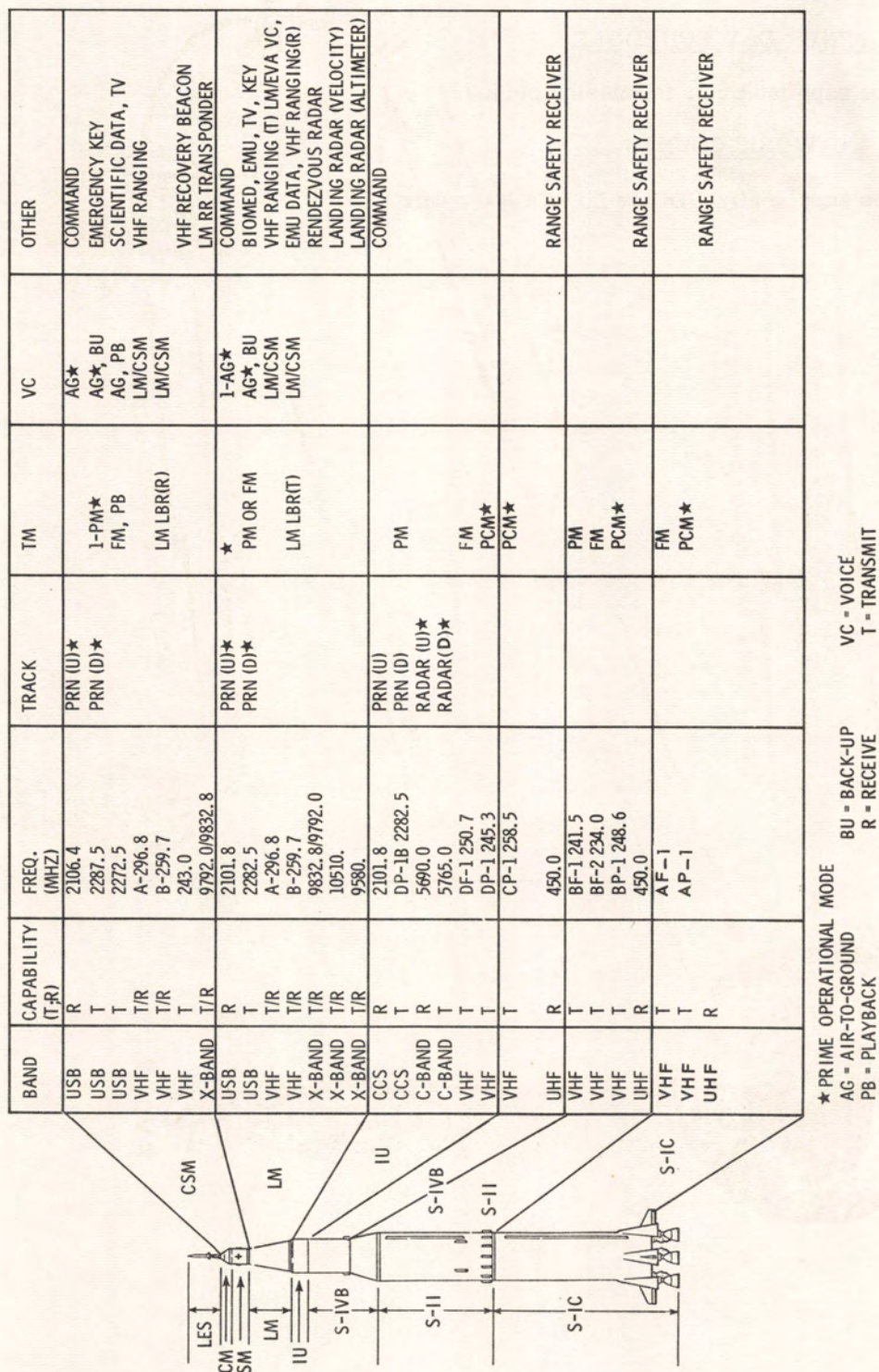
Table 1-1 shows the MSFN configuration and indicates the support to be provided by each station.

1.6 MINUS DAY SCHEDULE

To be supplied prior to mission period.

1.7 NETWORK COUNTS

To be supplied by PDC or ISI at a later date.



The diagram illustrates the Saturn V CSM/LM Instrumentation Configuration. It shows the CSM (Command Service Module) and LM (Lunar Module) with various instrumentation systems labeled: LES, CM, SM, LM, IU, S-IVB, S-II, S-IC, and S-IC. Lines connect these systems to the corresponding rows in the instrumentation table below.

BAND	CAPABILITY (T/R)	FREQ. (MHZ)	TRACK	TM	VC	OTHER
USB	R	2106.4	PRN (U)★		AG★	COMMAND
USB	T	2287.5	PRN (D)★		AG★, BU	EMERGENCY KEY
USB	T	2272.5			AG, PB	SCIENTIFIC DATA, TV
VHF	T/R	A-296.8			LM/CSM	VHF RANGING
VHF	T/R	B-299.7			LM/CSM	VHF RECOVERY BEACON
VHF	T	243.0				LM RR TRANSPONDER
X-BAND	T/R	9792.0/9832.8				
USB	R	2101.8	PRN (U)★	★	I-AG★	COMMAND
USB	T	2282.5	PRN (D)★	PM OR FM	AG★, BU	BIOMED, EMU, TV, KEY
VHF	T/R	A-296.8			LM/CSM	VHF RANGING (T) LM/EVA VC,
VHF	T/R	B-299.7			LM/CSM	EMU DATA, VHF RANGING(R)
X-BAND	T/R	9832.8/9792.0				RENDEZVOUS RADAR
X-BAND	T/R	10510.				LANDING RADAR (VELOCITY)
X-BAND	T/R	9580.				LANDING RADAR (ALTITUDE)
CCS	R	2101.8	PRN (U)			COMMAND
CCS	T	DP-1B 2282.5	PRN (D)	PM		
C-BAND	R	5690.0	RADAR (U)★			
C-BAND	T	5765.0	RADAR (D)★			
VHF	T	DF-1 250.7		FM		
VHF	T	DP-1 245.3		PCM★		
VHF	T	CP-1 258.5		PCM★		
UHF	R	450.0				RANGE SAFETY RECEIVER
VHF	T	BF-1 241.5		PM		
VHF	T	BF-2 234.0		FM		
VHF	T	BP-1 248.6		PCM★		
UHF	R	450.0				RANGE SAFETY RECEIVER
VHF	T	AF-1		FM		
VHF	T	AP-1		PCM★		
UHF	R					RANGE SAFETY RECEIVER

★ PRIME OPERATIONAL MODE
 AG = AIR-TO-GROUND
 PB = PLAYBACK
 BU = BACK-UP
 R = RECEIVE
 VC = VOICE
 T = TRANSMIT

Figure 1-1. Saturn V CSM/LM Instrumentation Configuration

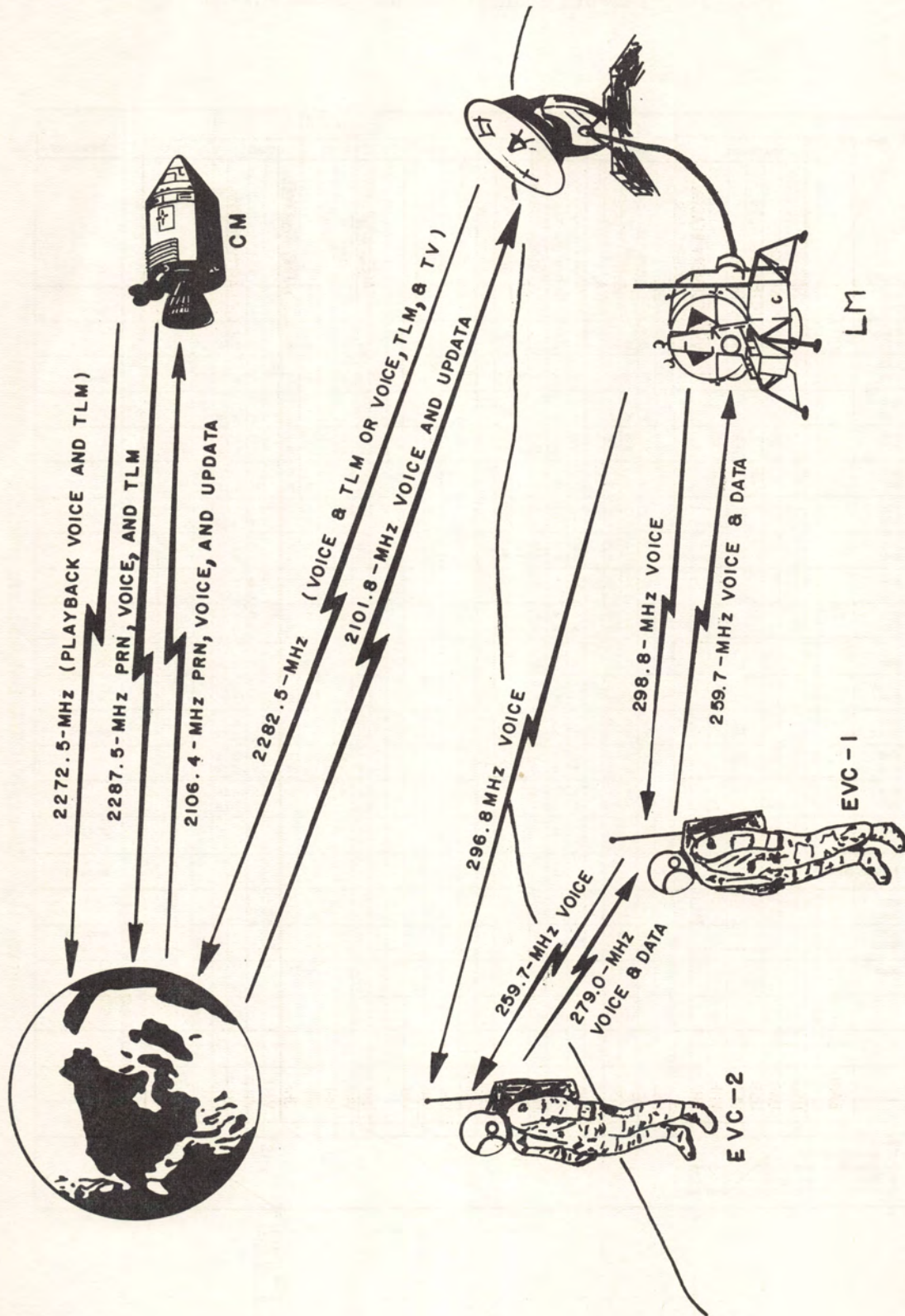


Figure 1-2. Communications During Lunar Surface Operations

Table 1-1. Network Configuration for AS-506 Mission

Systems Facilities	TRACKING				USB				TLM				CMD				DATA PRO- CESSING				COMM				OTHER				REMARKS
	C-band (High Speed)	C-band (Low Speed)	ODOP	USB	Optical	TV to MCC	Voice	TLM	Command	VHF Links	FM Remoting	MAG Tape Recording	Decoma	Displays	CMD Destruct		642B TLM	642B CMD	CDP	1218	High-Speed Data	TTY	Voice (SCAMA)	Voice VHF A/G	Biometer	SPAN			
PAT CNV	X	X													X														Note 1
MLA MIL	X	X		X			X	X	X	X	X	X	X				X	X	X	X	X	X	X	X					
GBI GBM	X	X		X			X	X	X	X	X	X	X		X		X	X	X	X	X	X	X	X					Note 2
ANT ANG	X	X		X			X	X	X	X	X	X	X		X		X	X	X	X	X	X	X	X					
BDA CYI	X	X		X			X	X	X	X	X	X	X		X		X	X	X	X	X	X	X	X	X	X			
ASC ACN	X	X		X			X	X	X	X	X	X	X				X	X	X	X	X	X	X	X					
PRE TAN		X								X	X											X	X	X					
CRO GWM	X	X		X			X	X	X	X	X	X	X				X	X	X	X	X	X	X	X	X	X			
HAW CAL	X	X		X			X	X	X	X	X	X	X				X	X	X	X	X	X	X	X	X	X			
GDS GYM				X			X	X	X	X	X	X	X				X	X	X	X	X	X	X	X					
TEX				X			X	X	X	X	X	X	X				X	X	X	X	X	X	X	X					
LIMA HSK				X			X	X	X	X	X	X	X				X	X	X	X	X	X	X	X	X				
MAD ARIA (8)				X			X	X	X	X	X	X	X				X	X	X	X	X	X	X	X					Note 2
RED VAN	X	X		X			X	X	X	X	X	X	X				X	X	X	X	X	X	X	X					
MER HTV		X		X			X	X	X	X	X	X	X				X	X	X	X	X	X	X	X					
MARS (210 ft)							X			X																			Note 4
PARKES (210 ft)							X			X																			Note 4
GTK AOCC	X	X													X							X	X						
GDSX HSIX				X			X	X	X											X	X								Note 3 Note 3
MADK				X			X	X	X											X									Note 3

Note
1. launch phase
2. launch & earth orbit phase
3. Post TLI coverage
4. lunar surface operations only

PART II
POLICIES

NOTE

Sections 10 through 18 require no supplementary information for the AS-506 mission (See the NOD).

PART III
OPERATIONS PROCEDURES

NOTE

Sections 31, 32, 34, 41, and 42 require no supplementary information for the AS-506 mission (See the NOD).

Supplement to Section 33

Teletype Formats

SUPPLEMENT TO SECTION 33. TELETYPE FORMATS

33.1 GENERAL

As described in Section 33 of the NOD, Apollo series B routing indicators will be used for the AS-506 mission.

33.2 POSTLAUNCH INSTRUMENTATION MESSAGE (PLIM)

For this mission, "GALA" will be deleted from the PLIM message routing and heading at launch + 30 hours.

33.3 MIL PRELAUNCH CRF

This message is discussed in Section 40 of these supplements.

33.3.1 PRECEDENCE

NN

33.3.2 ROUTING INDICATORS

GCTR

33.3.3 CLASSIFICATION

CRF

33.3.4 EXAMPLE

NN GCTR
DE GMIL 042
18/1247Z
FM M&O
TO GCTR/NOM

CRF NCG-XXX

I. CSM USB TRANSPONDER

A. CSM/PM Downlink

1. Unlocked freq as read from ground rcvr VCO (MHz)
2. Signal strength (dbm)
3. Time to acquire (SEC)
4. Lock freq (Zero SPE) as read from ground rcvr VCO (MHz)
5. Subcarrier below carrier (Go/No Go)
6. 1.024 MHz upper (db)
7. 1.024 MHz lower (db)
8. 1.250 MHz upper (db)
9. 1.250 MHz lower (db)
10. PCM Sync (Go/No Go)
11. Voice quality (Go/No Go)

- B. CSM/FM Downlink
 - 1. FM Xmitter center freq (if available) as read from ground rcvr VCO
- II. LM USB TRANSPONDER
 - A. LM/PM Downlink
 - 1. Unlocked frequency as read from ground receiver VCO (MHz)
 - 2. Signal strength (dbm)
 - 3. Time to acquire (SEC)
 - 4. Lock freq (Zero SPE) as read from ground receiver VCO (MHz)
 - 5. Subcarrier below carrier (Go/No Go)
 - 6. 1.024 MHz upper (db)
 - 7. 1.024 MHz lower (db)
 - 8. 1.250 MHz upper (db)
 - 9. 1.250 MHz lower (db)
 - 10. PCM Sync (Go/No Go)
 - 11. Voice quality (Go/No Go)
- III. SLV USB TRANSPONDER (CCS)
 - A. CCS/PM Downlink
 - 1. Unlocked freq as read from ground rcvr VCO (MHz)
 - 2. Signal strength (dbm)
 - 3. Time to acquire (SEC)
 - 4. Lock freq (Zero SPE) as read from ground rcvr VCO (MHz)
 - 5. Subcarrier below carrier (Go/No Go)
 - 6. 1.024 MHz upper (db)
 - 7. 1.024 MHz lower (db)
 - 8. PCM Sync (Go/No Go)
- IV. VHF AIR/GROUND VOICE
 - A. 296.8 Center Freq
 - B. 259.7 Center Freq

18/1301Z FEB GMIL

33.4 SITE CONFIGURATION MESSAGE (SCM)

33.4.1 EARTH ORBITAL SCM

33.4.1.1 General. The SCM is transmitted by the CCATS Instrumentation Tracking Controller (TRACK) to each station and to the NOM before that station's horizon time. The message will contain the following configuration information for the upcoming pass:

- a. Vehicle to be tracked
- b. USB modes (uplink, PM downlink, FM downlink)
- c. Radar tracking requirements
- d. Telemetry onstation biomed patching
- e. Air/Ground (A/G) voice requirements

- f. Handover/carrier on/off times
- g. Other specific MCC requirements.

33.4.1.2 Precedence. SS

33.4.1.3 Routing Indicators. Routing indicators will include the station indicator (s), GCTR, HDYN, HNET, HOPS, and HOSC. HOSC will be used only for those SCMs sent to stations supporting the IU/CCS.

33.4.1.4 Classification. SCM

33.4.1.5 When Transmitted. An SCM will be generated by Track and transmitted to arrive at a specific station no later than H-30 minutes. A new message will be generated for each station pass. Information contained in the SCM will be pertinent to the revolution number specified.

33.4.1.6 Text Format

a. General

(1) The first line of the SCM will contain the message classification (SCM) followed by the 3-letter station designator. Following the station designator will be the revolution number to which the message applies. All times given in the SCM will be GET. The SCM will be divided into five separate sections as follows:

- (a) USB (Section A)
- (b) Telemetry (Section B)
- (c) A/G (Section C)
- (d) C-band (Section D)
- (e) Note (Section E).

(2) Any section which does not apply to a specific station or is not required to satisfy mission requirements, will contain N/A.

b. USB

(1) USB configuration information will be given in seven columns.

(2) The first column will indicate the system to which all information on that horizontal line applies. Various systems may be required depending on the type of station. For example, for single stations, only system 1 applies; for dual stations systems 1 and 2 apply; for 85-foot antenna stations, systems 1 and 2 apply to the prime station and systems 3 and 4 are for the wing station. In cases where systems 2, 3, or 4 are available and configuration is not specified in the SCM, these systems may be configured in accordance with the mission supplements or at station discretion.

(3) The second column will indicate the vehicle to be tracked by the system indicated in column 1. The three possible vehicles which may be assigned are CSM, LM, and IU.

(4) The third column assigns the USB modes and is divided into three parts. The first digit is the uplink mode, the next two digits are the PM downlink mode, and the last two digits are the FM downlink mode.

(5) Columns 4 and 5 indicate the type (high and/or low speed) of trajectory data required. If column 4 contains the letter H, high-speed trajectory data is required. An L in column 5 indicates that low-speed trajectory data is required.

(6) Columns 6 and 7 indicate carrier on/off times. These times will be given and will apply whether or not a handover occurs. If the word "PASSIVE" appears, in lieu of carrier on/off times, the system has been scheduled and the carrier will be brought up only if directed by RTC. The word "SAME" in any time block (USB systems 2, 3, or 4 or A/G) means that the on/off or remote/local time is the same as for USB system 1.

EXAMPLE

A. USB

1 CSM 6.02.00² H L ON: 01:44:00 OFF: 01:50:00
~~2 CSM 0.00.02~~

c. TLM

(1) This TLM section will provide information for onstation biomed patching. Nine separate numbers, each separated by a slant bar, and each representing one specific parameter, will be given. The parameters are fixed and will be given in the following order:

CJ0060/CJ0061/CJ0062/GT9999/GT8124/GT8224/CJ0200/
 CJ0201/CJ0202

(2) The number appearing in each position will be the IRIG channel to which that particular parameter must be patched. The numeral zero indicates that a parameter is not required. The numeral 1 will not be used as the channel always contains the station ID. The numerals 2 through 7 correspond to the particular IRIG channels required.

EXAMPLE

B. TLM

7/6/5/0/0/0/4/3/2

d. A/G

(1) General. The Air/Ground section will reflect only VHF configuration information and remote/local times which control (a) uplinking of VHF mode indicated or (b) enabling of best source (USB/VHF) downlink to MCC.

(2) Vehicles. Column 1 will indicate only the vehicle to which the VHF transmitting antenna will be pointed. Stations will ensure VHF communication is available to this vehicle. Dual VHF stations will track the opposite vehicle with their second antenna.

(3) Mode. Only the following VHF modes will be given in column 2 (Refer to table 51-3 of NOD):

SA - Simplex A

DA - Duplex A

SB - Simplex B

DB - Duplex B

(4) Remote/Local times will be given for uplinking of VHF mode to specified vehicle ~~en~~ enabling best source downlink (VHF/USB) to MCC.

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Notes

1. ComTech may reference USB (Section 54) to ensure he has USB receive capability from one or two vehicles.

2. If the word "SAME" appears following remote, the remote/local times are respectively the same as USB "system 1" carrier on/off times.

3. If the word "PASSIVE" appears following the word remote, no remoting of VHF uplink or best source downlink is required.

EXAMPLE

C. A/G

CSM	SA	Remote	01:44:00	Local	01:50:00
-----	----	--------	----------	-------	----------

e. C-band

(1) This section will give C-band radar tracking requirements in four columns.

(2) The first column will contain the radar type; all other information on the horizontal line will apply to the radar system indicated. (Two systems are possible at BDA and CAL.) The following list indicates the symbols which will be used and the corresponding radar type:

<u>Symbol</u>	<u>Radar Type</u>
16	FPS-16 and CAPRI
6	FPQ-6
18	TPQ-18
25	MPS-25

(3) The second column will indicate the vehicle to be tracked. The four possible vehicles which may be assigned are CSM, LM, IU, and S-IVB.

(4) The third column will contain the mode of track to be used. BCN will indicate beacon track and SKN will indicate skin track.

(5) Columns 4 and 5 will indicate the type of trajectory data to be sent to MCC. An H in column 4 indicates high-speed data; an L in column 5 indicates low-speed data. Unless otherwise specified in the SCM, C-band data will be post-pass when line limitations exist.

EXAMPLE

D. C-BAND

6 CSM SKN L

16 IU BCN L

f. Notes. This section is included to assist in clarifying any questionable items given in the previous sections. For missions with variable launch azimuths, the launch azimuth will also appear in this section of the SCMs transmitted to all stations prior to liftoff.

EXAMPLE

E. NOTES

1. C-BAND: FPS-16 DATA POSTPASS

33.4.1.7 Text Examples. The following are typical examples of messages in the SCM format. For an explanation of the various entries, refer to the corresponding area of the preceding text:

a. SS GBDA HDYN HNET HOPS GCTR

DE HMSC 006

16/1305Z

SCM BDA 2/2

A. USB

1 CSM 6.02.00 H L ON: 01:44:00 OFF: 01:50:00

~~2 CSM 0.00.02~~

B. TLM

7/6/5/0/0/0/4/3/2

C. A/G

CSM DA REMOTE: SAME

D. C-BAND

6 CSM SKN L

16 IU BCN L

E. NOTES

1. C-BAND: FPS-16 DATA POSTPASS

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b. SS GGDS GCTR HDYN HNET HOPS

DE HMSC 012

18/1400Z

SCM GDS 61/61

A. USB

1 CSM 6.02.02 H L ON: 94:36:30 OFF: 94:41:30

PDC#12.

~~2 CSM 6.00.02~~

3 LM 5.02.00 L ON: 94:38:30 OFF: 94:43:00

B. TLM

7/6/5/0/0/0/4/3/2

C. A/G - N/A

D. C-BAND N/A

E. NOTES

1. Remote USB voice

33.4.2 POST-TRANSLUNAR INJECTION (TLI) SCM

33.4.2.1 General

a. Track will transmit the post-TLI SCM to arrive onstation no later than 30 minutes before the first period of support indicated in the SCM. The SCM will contain the configuration required for the USB systems, the vehicle to be tracked, the system modes, the TTY requirement, biomed parameter patching, and the time when support is required to begin.

b. S-band is to be used exclusively after TLI. Because of range limitations, coverage of the IU will be terminated within 1 or 2 hours after TLI. C-band requirements will be included in the earth-orbital SCMs for the applicable stations. VHF A/G voice through VHF LOS will be included in the earth-orbital SCMs.

NOTE

"IN ADDITION TO POST-TLI SCM'S EARTH-ORBITAL SCM'S WILL BE SENT TO STATIONS HAVING VIEW OF THE SPACECRAFT DURING THE PERIOD FROM SCHEDULED TLI TO AT LEAST TLI PLUS 30 MINUTES. THESE MESSAGES WILL PROVIDE CONFIGURATION INFORMATION REQUIRED IN CASE OF TLI CANCELLATION OR FAILURE."

c. AOS/LOS times for each view period will not be included in the post-TLI SCM. Site release messages will contain AOS/LOS times for the station's next scheduled view period.

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b. SS GGDS GCTR HDYN HNET HOPS

DE HMSC 012

18/1400Z

SCM GDS 61/61

A. USB

1 CSM 6.02.00 H L ON: 94:36:30 OFF: 94:41:30

2 CSM 0.00.02

3 LM 5.02.00 L ON: 94:38:30 OFF: 94:43:00

B. TLM

7/6/5/0/0/0/4/3/2

C. A/G - N/A

D. C-BAND N/A

E. NOTES

1. Remote USB voice

STOP NEW
PAGE

33.4.2 POST-TRANSLUNAR INJECTION (TLI) SCM

33.4.2.1 General

a. Track will transmit the post-TLI SCM to arrive onstation no later than 30 minutes before the first period of support indicated in the SCM. The SCM will contain the configuration required for the USB systems, the vehicle to be tracked, the system modes, the TTY requirement, biomed parameter patching, and the time when support is required to begin.

b. S-band is to be used exclusively after TLI. Because of range limitations, coverage of the IU will be terminated within 1 or 2 hours after TLI. C-band requirements will be included in the earth-orbital SCMs for the applicable stations. VHF A/G voice through VHF LOS will be included in the earth-orbital SCMs.

Note

In addition to post-TLI SCM's, earth-orbital SCM's will be sent to some stations to provide configuration information in case of TLI cancellation or failure.

c. AOS/LOS times for each view period will not be included in the post-TLI SCM. Site release messages will contain AOS/LOS times for the station's next scheduled view period.

33.4.2.2 Precedence. SS

33.4.2.3 Routing Indicators. Routing indicators will include the station indicator(s), GCTR, HDYN, HNET, HOPS, and HOSC. HOSC will be used only on SCM s for those stations supporting the IU/CCS.

33.4.2.4 Classification. SCM33.4.2.5 Text Format

a. General. Under normal teletype circuit conditions, each line of the text will be transmitted once. Following the message classification (SCM) will be the three-letter station designator.

b. GET. The first vertical column will indicate the time (in hours, minutes, and seconds GET) the station is required to effect the configuration delineated in the remainder of SCM. If the mode represents a change to or from an uplink mode, the time in this column will be the carrier on or off time. The A/G ~~downlink~~ voice will go remote or local to coincide with carrier on or off times.

c. SYS. The second column designates the USB systems required. For single USB stations, the number 1 will appear in this column. For dual USB stations, either 1 or 2 will appear; if only 1 appears, the station may configure the second system in accordance with Section 54 of these supplements. For stations with 85' antennas, 1 and 2 represent prime station systems and 3 and 4 are wing station systems. If no number appears in this column, no support is required for that pass.

d. VEH. The third column designates the vehicle assigned to the USB system in column 2. The assignments are not made in order of priority; for example, if systems 1 and 2 are assigned to CSM and LM respectively and system 1 fails, the assignment for system 2 should not be changed to CSM unless directed.

e. MODE. In the fourth column, three USB modes are designated. The first digit indicates the uplink mode, the second two digits indicate downlink PM mode, and the third two digits indicate downlink FM mode; "00" indicates the link is not required. All modes are described in Section 54 of the NOD. Both the numerical code (from column 4) and the vehicle (from column 3) are required to obtain the proper USB configuration.

f. LS. If low-speed tracking data is required, an X will appear in the fifth column.

g. Biomed Parameter Patching. This section will provide information for onstation biomed patching. Nine separate numbers, each separated by a slant bar, and each representing one specific parameter, will be given. The parameters are fixed and will be given in the following order:

CJ0060/CJ0061/CJ0062/GT9999/GT8124/

GT8224/CJ0200/CJ0201/CJ0202

AT STATION
DISCRETION

The number appearing in each position will indicate the IRIG channel to which that particular parameter must be patched. The numeral 0 indicates that a parameter is not required. The numeral 1 will not be used as the channel always contains the station ID. The numerals 2 through 7 correspond to the particular IRIG channels required.

EXAMPLE

7/6/5/0/0/0/4/3/2

h. Note. This column will indicate if a note, found at the end of the message, applies to that view period.

33.4.2.6 Format Example. The following is an example of a post-TLI SCM format:

SS HOSC GBDA GCTR HDYN HNET HOPS

DE HMSC 006

20/1305Z

GET	SYS	VEH	MODE	LS	BIOMED PARAMETER PATCHING NOTES
00:90:00	1	CSM	6:02:00	X	2/3/4/0/0/0/5/6/7
00:98:00	2	LM	6:02:00		0/5/0/6/0/0/0/2/0

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33.4.2.7 Acknowledgement Message Text. Each station will acknowledge receipt of a post-TLI SCM by TTY to HNET, in accordance with the format given in paragraph 33.2.2 of the NOD.

33.5 DSE DUMP REPORT MESSAGE

33.5.1 GENERAL

This message will be sent only if a station receives a DSE tape dump. Times will be reported to reflect any discontinuity in times greater than 1 minute, or any bit rate change. All times will be in days, hours, and minutes.

33.5.2 PRECEDENCE

NN

33.5.3 ROUTING INDICATORS

GCTR HALO HNET HMSC HSPO

33.5.4 CLASSIFICATION

OPN

33.5.5 TEXT EXAMPLE

The following example illustrates the DSE Dump Report Message format:

NN GCTR HALO HNET HMOC HSPO
DE GGDS 011
26/1405Z
FM M10
TO HNET/NC
INFO GCTR/NOM

OPN NCG XXX
DSE DUMP GET XXX:XX (hours: min) Rev. No. (earth orbital only)
GMT CSM MODULATION ON XX/XXXXZ
GMT CSM MODULATION OFF XX/XXXXZ
CTE START XX:XX:XX HLBR
STOP XX:XX:XX
START XX:XX:XX HLBR
STOP XX:XX:XX
START XX:XX:XX HBR
STOP XX:XX:XX
START XX:XX:XX HBR
STOP XX:XX:XX
START XX:XX:XX HLBR
STOP XX:XX:XX

VOICE QUALITY OF THE RECORDED VOICE (Ref paragraph 42.2.9 of NOD for criteria)

CSM DATA QUALITY (GOOD, MARGINAL, UNUSABLE)

GMT LM MODULATION ON XX/XXXXZ

GMT LM MODULATION OFF XX/XXXXZ

MET START XX:XX:XX HLBR

STOP XX:XX:XX

START XX:XX:XX HLBR

STOP XX:XX:XX

START XX:XX:XX MLBR

STOP XX:XX:XX

LM DATA QUALITY (GOOD, MARGINAL, UNUSABLE)

26/1453Z MAR GGDS

33.5.6 TEXT EXPLANATION

Recorder times will be given as Central Timing Equipment time (CTE) or Mission Elapsed Time (MET) (days, hours, minutes). Several periods of data may be recorded on the Data Storage Equipment (DSE). Start and stop times (CTE/MET) will be repeated for each segment of recorded data. An explanation of voice quality readings is given in paragraph 42.2.9 of the NOD. Modulation on and off times will be the GMT (day of month, hours, minutes) noted by the USB demod technician when actual modulation starts and stops. Section 57 of these supplements contains bit rate definitions.

SDE NEW
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33.5.5 TEXT EXAMPLE

The following example illustrates the DSE Dump Report Message format:

NN GCTR HALO HNET HMOC HSPO
DE GGDS 011
26/1405Z
FM M10
TO HNET/NC
INFO GCTR/NOM

OPN NCG XXX

DSE DUMP GET XXX:XX (hours: min) Rev. No. (earth orbital only)

GMT CSM MODULATION ON XX/XXXXZ

GMT CSM MODULATION OFF XX/XXXXZ

CTE START XX:XX:XX HLBR

STOP XX:XX:XX

START XX:XX:XX HLBR

STOP XX:XX:XX

START XX:XX:XX HBR

STOP XX:XX:XX

START XX:XX:XX HBR

STOP XX:XX:XX

START XX:XX:XX HLBR

STOP XX:XX:XX

VOICE QUALITY OF THE RECORDED VOICE (Ref paragraph 42.2.9 of NOD for criteria)

CSM DATA QUALITY (GOOD, MARGINAL, UNUSABLE)

GMT LM MODULATION ON XX/XXXXZ

GMT LM MODULATION OFF XX/XXXXZ

MET START XX:XX:XX HLBR

STOP XX:XX:XX

START XX:XX:XX HLBR

STOP XX:XX:XX

START XX:XX:XX MLBR

STOP XX:XX:XX

LM DATA QUALITY (GOOD, MARGINAL, UNUSABLE)

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26/1453Z MAR GGDS

33.5.6 TEXT EXPLANATION

Recorder times will be given as Central Timing Equipment time (CTE) or Mission Elapsed Time (MET) (days, hours, minutes). Several periods of data may be recorded on the Data Storage Equipment (DSE). Start and stop times (CTE/MET) will be repeated for each segment of recorded data. An explanation of voice quality readings is given in paragraph 42.2.9 of the NOD. Modulation on and off times will be the GMT (day of month, hours, minutes) noted by the USB demod technician when actual modulation starts and stops. Section 57 of these supplements contains bit rate definitions.

MAG TAPE RECORD:

GDS DSS NO. 630 RECORD NO. 7

START: XXX/XXXXZ STOP: XXX/XXXXZ (JULIAN GMT DATE)

GDS DSS NO. 632 RECORD NO. 8

START: XXX/XXXXZ STOP: XXX/XXXXZ (JULIAN GMT DATE)

33.6 TLI ADVISORY MESSAGE

33.6.1 GENERAL

Following TLI cutoff, the Network Controller will transmit a TLI Advisory Message containing the following information:

- a. TLI ignition (GET)
- b. TLI cutoff (GET)
- c. A general statement of TLI success or failure
- d. GET when stations will change SLV MAP waiting period to 500 milliseconds and CSM and LM MAP waiting periods to 2.8 seconds (nominally TLI cutoff plus 50 minutes)
- e. GET when stations will change SLV MAP waiting period to 750 milliseconds (nominally TLI cutoff plus 3 hours)
- f. GET when stations will change CSM, LM, and SLV retransmit settings to zero (nominally TLI cutoff plus 10 hours)
- g. GET when 85-foot antenna stations will radiate 10kw (nominally TLI cutoff plus 3 hours)
- h. A statement of which SCMs and acquisition messages to use.

Note

If a planned TLI does not occur, the NC will transmit a message to this effect and acquisition message procedures described in paragraph 40.1.5.2. a, c will be in effect.

33.6.2 PRECEDENCE

SS

33.6.3 ROUTING INDICATORS

DSDC GCTR HNET HALO HFOS

33.6.4 CLASSIFICATION

~~SECRET~~ SPE.

33.6.5 TEXT EXAMPLE

SS DSDC GCTR HNET HALO HFOS

DE HMSC 072

21/1550Z

1 PDC
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TO ALL

OPN NCG XXX

1. TLI ignition XXX:XX: (HRS:MIN) GET
2. TLI cutoff XXX:XX: (HRS:MIN) GET
3. TLI burn was nominal.
4. Change CSM and LM MAP waiting period to 2.8 seconds and SLV MAP waiting period to 500 milliseconds at (HRS:MIN) GET.
5. Change SLV MAP waiting period to 750 milliseconds at (HRS:MIN) GET.
6. Change retransmit setting to zero at (HRS:MIN) GET.
7. 85-foot antenna stations use 10kw output at (HRS:MIN) GET.
8. Use post-TLI SCMs and acquisition messages.

33.7 TELETYPE ROUTING INDICATORS

33.7.1 COLLECTIVE

33.7.1.1 SDI-102B--DSDB

a. Routing Indicators

ACRO AHSK GACN GANG GBDA GAMR GCAL
GCTR GETC GGDS GGBM GGYM GMIL GNSO GTEX
GSTS GUPA GWTR HMSC LCYI LMAD
LTAN PGWM PHAW MHTV MMER MRED MVAN

b. Action Addressees, All MSFN Stations

c. Information Addressees

GAMR/AFE70/DDMS ETOOP-2
GAMR/RCAP/ETVPS
GAMR/AFE71/YOKEN
GWTR/DISTRIBUTION

MHTV/NASA SHIPS REP
MMER/NASA SHIPS REP
MRED/NASA SHIPS REP
MVAN/NASA SHIPS REP

33.7.1.2 SDI-103C--DSDCa. Routing Indicators

ACRO ACSW AHSK APBA ASFA GACN GALA GANG GAMR
GBDA GCAL GCDF GCNV GETC GGBM GGDS GGYM GKSC GMIL
GNSO GSTS GTEX GUPA GWTR HMSC JJPL JOCC LCYI
LLDN LMAD LROB LTAN MMER MHTV MRED MVAN PGSW
PGWM PHAW PHON

| PDC
#12b. Action Addressees. Per the message addressc. Information Addressees

APBA/AMERICAN PROJECTS BRANCH
ASFA/NETWORK SUPPORT FACILITY
GAMR/AFE70/DDMS ETOOP-2
GAMR/RCAP/ETVPS ARCPE
GAMR/AFE71/YOKEN YZKEN ETOOT-1
GALA/PM-MO-RC
GCNV/RTCS
GKSC/ALDS-CIF-TS-TSM-3
GWTR/DISTRIBUTION
GUPA/AOCC
MVAN/NASA SHIPS REP
MRED/NASA SHIPS REP
MMER/NASA SHIPS REP
MHTV/NASA SHIPS REP
JJPL/R NUTTAL

33.7.1.3 SDI-105E--DSDEa. Routing Indicators

AHSK ACRO ACSW ANRC APBA ASFA GALA GAMR GANG
GACN GBDA GBEN GBFO GCAL GCNV GETC GGBM GGDS GGYM
GKSC GMIL GNET GOPS GNSO GRGO GSTS GTEX ~~GBDA~~
GUPA GWAB GWTR HMSC JOCC JJPL JGLD LCYI
LLDN LMAD LROB LRDO LTAN MHTV MRED MVAN MMER PGWM
PHAW PHON ~~PGSW~~

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b. Action Addressees

APBA/AMERICAN PROJECTS BRANCH
 ASFA/NETWORK SUPPORT FACILITY
 AHSK/STADIR M&O
 ACRO/STADIR M&O
 GACN/STADIR M&O
 GANG/STADIR M&O
 GBDA/STADIR M&O
 GETC/STADIR M&O
 GGBM/STADIR M&O
 GGDS/STADIR M&O
 GGYM/STADIR M&O
 GKSC/TS-TSM-3
 GAMR/AFE71/ETOOT-1
 GAMR/AFE70/DDMS
 GMIL/STADIR M&O MILSO
 GSTS/CODE 541 801 833 842 843 NNSG
~~GTWL/CODE 873~~
 GTEX/STADIR M&O
 GWAB/OPS CONTROL CENTER
 GWTR/DISTRIBUTION HAVE SURF
 HMSC/NETOPS
 JOCC/DSN OCC
 LCYI/STADIR M&O
 LMAD/STADIR M&O
 LTAN/STADIR M&O
 PGWM/STADIR M&O
 PHAW/STADIR M&O
 GNSO/NTS

c. Information Addressees

ANRC/NASA SENIOR SCIENTIFIC REP CANBERRA
 ACSW/NASA SWITCHING CENTER
 GALA/J LADNER PM-MO-O
 GBEN/CODE 100
 GBFO/NASLUND FLIGHT OPERATIONS
 GWTR/DISTRIBUTION
 GAMR/AFE71/YOKEN YZKEN
 GAMR/RCAP/ETVPS ARCPE
 GAMR/AFE 70/ETOOP-2
 GNET/NETCON
 GRGO/CODE G KSC ULOWTR GSFC REP
 LLDN/NASA SWITCHING CENTER
 GUPA/AOCC
 MVAN/SHIP OPERATION MANAGER NASA SHIPS REP
 MMER/SHIP OPERATION MANAGER NASA SHIPS REP
 MRED/SHIP OPERATION MANAGER NASA SHIPS REP
 MHTV/SHIP OPERATION MANAGER NASA SHIPS REP
 PGSW/NASA SWITCHING CENTER
 PHON/NASA SWITCHING CENTER
 LROB/NASA SWITCHING CENTER
 GOPS/OPSCON
 GNSO/NTS - GCAL/SITENAGER. M - O.
 LRDO/NASA REP MADRID, SPAIN

JJPL/E DAVIS I EMIG R NUTTAL P GOODWIN COMM CONTROL
NNSG REP
GCNV/RTCS
JGLD/COMM CONTROL

33.7.1.4 SDI-111K--DSDKa. Routing Indicators

ACRO AHSK GACN GAMR GANG GBDA GCTR GGBM GGDS
GGYM GMIL GSTS GTEX GUPA HMSC LCYI LMAD MHTV
MMER MRED MVAN PGWM PHAW

b. Action Addressees. Per message addressc. Information Addressees

GAMR/AFE71/YOKEN
GAMR/AFE70/DDMS
GSTS/CODES 833 834 841 842
GUPA/AOCC
MHTV/NASA SHIPS REP
MMER/NASA SHIPS REP
MVAN/NASA SHIPS REP
MRED/NASA SHIPS REP

33.7.1.5 SDI-120T--DSCTa. Routing Indicator

GDSC GDRO HMDC

b. Action Addressees

HMDC/Houston LOAD CONTROL
GDSC/GSFC COMPUTERS
GDRO/MSFNOC DATA LOCATION

33.7.1.6 SDI-123SW--DSSWa. Routing Indicator

ACSW LLDN LROB PGSW PHON GSTS

b. Action Addressees. All NASCOM Switching Centers33.7.1.7 Houston Staff Support Rooms (Collective) -- HALOa. Routing Indicators

HGEM HDYN HAGE HOPS HBOS

33.7.1.8 SDI-114DT--DSDTa. Routing Indicators

GQKC GQNA HSPO

b. Remarks. CSM Telemetry rebroadcast summaries33.7.1.9 SDI-115U--DSDUa. Routing Indicators

GQKC GQGA HSPO

b. Remarks. LM Telemetry rebroadcast summaries33.7.1.10 SDI-116V--DSDVa. Routing Indicators

GQKC GQMI GQNA GQTR HDYN HSPO

b. Remarks. AGC Telemetry rebroadcast summaries33.7.1.11 SDI-117W--DSDWa. Routing Indicators

GQKC GQGA GQMI GQTR HDYN HSPO

b. Remarks. LGC Telemetry rebroadcast summaries33.7.1.12 SDI-118X--DSDXa. Routing Indicators

GQKC GQGA GQTR HDYN HSPO

b. Remarks. AGS Telemetry rebroadcast summaries

33.7.2 STATION LISTING

APBA	-	American Projects Branch, Canberra
ASFA	-	Network Support Facility, Canberra
ABMW	-	MSFN Apollo Wing, Tidbinbilla
ACAB	-	MSFN Carnarvon (special routing)
ACRO	-	MSFN Carnarvon
ACSW	-	Canberra Switching Center
AHSK	-	MSFN Honeysuckle Creek
AMLN	-	MSFN Honeysuckle Creek (special routing)

GACN	-	MSFN Ascension
GALA	-	Marshall Space Center, Huntsville, Alabama
GAMR	-	(AFETR) Eastern Test Range Communications Center
GANG	-	MSFN Antigua Island
GANT	-	(AFETR) Antigua Island
GAPU	-	STADAN Lima, Peru
GASC	-	(AFETR) Ascension Island
GBDA	-	MSFN Bermuda
GBPM	-	MSFN Grand Bahama Island (special routing)
GCAL	-	MSFN Vandenberg AFB
GCDF	-	GSFC CADFISS
GCEN	-	GSFC MSFN Operations Center (MSFNOC)
GCNV	-	Cape Kennedy Air Force Station
GCQU	-	GSFC Computers (transmit only)
GCTR	-	GSFC Network Operations Manager (NOM)
GDCS	-	GSFC Computers
GDRO	-	GSFC MSFNOC Data Location
GETC	-	MSFN Engineering Training Center
GFMI	-	MSFN Merritt Island (special routing)
GGBI	-	(AFETR) Grand Bahama Island
GGBM	-	MSFN Grand Bahama Island
GGDS	-	MSFN Goldstone
GGEF	-	MSFN Guaymas (special routing)
GGPM	-	MSFN Goldstone (special routing)
GGTK	-	(AFETR) Grand Turk Island
GGYM	-	MSFN Guaymas
GKSC	-	Hq. Kennedy Space Center
GMIL	-	MSFN Merritt Island
GMLA	-	(AFETR) Merritt Island
GNSO	-	Goddard Network Support Office, PAFB
GPBA	-	MSFN Antigua Island (special routing)
GPMB	-	MSFN Ascension Island (special routing)
GPRE	-	(AFETR) Pretoria
GQGA	-	Grumman, Bethpage, N. Y.
GQKC	-	Kennedy Space (special routing)
GQMI	-	M.I.T. Cambridge, Mass.
GQNA	-	North American, Downey, Calif.
GQTR	-	TRW Inc., Redondo Beach, Calif.
GSCP	-	GSFC Communications Processor
GSPA	-	GSFC Operations/Service/Intercept/Advisory Area
GSRM	-	GSFC Special Refile Section
GSTS	-	GSFC Terminal Section
GTEX	-	MSFN Corpus Christi
GTIJ	-	MSFN Corpus Christi (special routing)
GUDA	-	MSFN Bermuda (special routing)
GUNV	-	GSFC MSFNOC (used only as directed)
GUPA	-	Aircraft Operation Control Center (AOCC), PAFB

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GWMW	-	MSFN Goldstone Apollo Wing
GWTR	-	Vandenberg AFB, WTR Communications Center
HACR	-	Houston, Auxiliary Computing Room (computer to computer only)
HAGE	-	Houston, Vehicle Systems SSR (LM)
HALO	-	Houston, Staff Support Room SSR (collective)
HBOS	-	Houston, Vehicle Systems SSR (booster)
HDYN	-	Houston, Flight Dynamics SSR
HENV	-	Houston, Enviromental Systems Console (WX room)
HFOS	-	Houston, Flight Operations Scheduling Office (FOSO)
HGEM	-	Houston, Vehicle System SSR (CSM)
HMCP	-	Houston, Communications Processor (CP)
HMDC	-	Houston, Load Control
HMOC	-	Houston, O&P Console MOCR
HMSC	-	Houston, Communications Center
HNET	-	Houston, Network Controller (NC)/CCATS
HOPS	-	Houston, Flight Director SSR (Plans console)
HOSC	-	Huntsville, Operations Support Center
HRTC	-	Houston, Real Time Computer Complex
HSIM	-	Houston, Simulation Control
HSPO	-	Houston, Apollo Spacecraft Program Office
JGLD	-	JPL, Comm Control
JOCC	-	JPL, DSN OCC
LCKL	-	MSFN Grand Canary Island (special routing)
LCYI	-	MSFN Grand Canary Island
LKMW	-	MSFN Madrid Apollo Wing
LLDN	-	London Switching Center
LMAD	-	MSFN Madrid Apollo
LROB	-	Madrid Switching Center
LTAN	-	MSFN/STADAN Tananarive
LZAA	-	MSFN Madrid (special routing)
MHTV	-	USNS Huntsville
MMER	-	USNS Mercury
MRED	-	USNS Redstone
MVAN	-	USNS Vanguard
PGWM	-	MSFN Guam
PGMF	-	MSFN Guam (special routing)
PGSW	-	Guam Switching Center
PHAW	-	MSFN Hawaii
PHON	-	Honolulu Switching Center
PHQR	-	MSFN Hawaii (special routing)

Supplement to Section 35

Data Handling

SUPPLEMENT TO SECTION 35. DATA HANDLING

35.1 GENERAL INSTRUCTIONS

All recorded mission data will be identified, annotated, labeled, packaged, and shipped in accordance with Section 35 of the NOD. Required data recordings can be found in the respective sections (Radar, Telemetry, USB, etc.) of these supplements.

35.2 DATA IDENTIFICATION NUMBERS (LOG NO.)

35.2.1 GENERAL

The log numbers assigned in the succeeding paragraphs are to be placed either in the log number on the applicable data identification label, in the upper right-hand corner of those data records which do not require labels, or on the leader portion of paper tapes.

35.2.2 NUMBERING SYSTEM

- a. The data identification numbering system is derived as follows:

Major Number	System	
<u>Group</u>	<u>Abbreviation</u>	<u>System</u>
000-099	A/A	Acquisition Aids
100-199	C-C	Computer Complex
200-299	CMD	Command
300-399	COM	Communications
400-499	RDR	Radar
500-599	TLM	Telemetry
600-699	USB	Unified S-band
700-799	SPN and JPT	SPAN and Jupiter Monitor
800-899		Miscellaneous data
900-999		Not used

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- b. Within each major number group, data items are subdivided as follows:

00-09	Paper tapes
10-29	Items transmitted by TTY
30-49	Magnetic tapes
50-53	Function-only stripcharts
54-56	Events strip charts
57	Oscillographic recordings
58-63	Function/events stripcharts
70-99	Operator logs, PLIM data sheets, command histories, computer printouts, TTY hard copies, etc.

35.2.3 SPECIFIC NUMBER ASSIGNMENTS

35.2.3.1 PLIMs and Operator Logs. PLIMs and operator logs are to be identified in accordance with the following number list. Specific instructions for completion of these forms and the data to be recorded are found in the appropriate sections of the NOD:

Identification Number	Item
070	A/A PLIM data sheet (Series 30)
170	C-C PLIM data sheet (Series 60)
171	CDP PLIM data sheet (Series 50)
270	CMD PLIM data sheet (Series 80)
370	COM PLIM data sheet (S/C) (Series 70)
371	COM PLIM data sheet (GCC) (Series 00)
470	RDR PLIM data sheet (Series 10)
570	TLM PLIM data sheet (Series 40)
670	USB PLIM data sheet (Series 20)
870 ARA	ARIA PLIM data sheet (Series 90)
882 ARA	TLM support summary
883 ARA	ABN TLM log
884 ARA	Navigator's log
885 ARA	MC Q/L report
886 ARA	Pre/post cal proc

35.2.3.2 Other Data Items. Identification numbers assigned to other data items are given in table 35-1.

Table 35-1. Data Identification Numbers

Identification Number	Item	Description
050	A/A s/chart	A 4-channel stripchart usually containing antenna azimuth and elevation error, AGC, and SDT
130	C-C raw data mag tape	Digital mag tape recording of raw USB and C-band tracking and navigational data from the CDP input buffers (ships only)
131	C-C log mag tape	Digital mag tape recording of the formatted input and processed output C-band, USB, and TLM tracking data and navigational data. Also includes time of changes in source for position, attitude, and prime tracking data (ships only).

Table 35-1. Data Identification Numbers (cont)

Identification Number	Item	Description
200	CMD history PT	Command history in TTY paper tape form (sent with the station data package)
231	CMD history mag tape	Historical record, on digital mag tape, of commands uplinked by a station (including SRS data and verification by the S/C)
273	CMD history TTY H/C	The printed page copy of commands uplinked by a station
274	CMD history tab	Programmable, computer processed print-out of the command history mag tape
330	Com A/G mag tape	Analog mag tape recording of ground and spacecraft communications, SDT, and other data outlined in the mission supplements
400	RDR LS data PT	Low-speed C-band radar tracking data in paper tape form (sent with data shipment)
430	RDR mag tape	Digital mag tape of computer processed raw radar tracking data
450	RDR func s/chart	Stripchart recording of azimuth, elevation, and range error; AGC; and SDT
456	RDR events s/chart	A 20-channel stripchart indicating tracking source; angle control; track mode; multiple gates on; interference; azimuth, elevation, and range designation; scan mode; radiation on or off; range verification; data acceptability; and timing (within the MSFN, available only from BDA)
458	RDR func/event s/chart	A 28-channel stripchart; twenty-four channels are events and four are the functions of azimuth, elevation, and range error, and AGC. SDT is recorded on the edge. The 24 events are standardized in Section 53 of the NOD.
473	RDR LS data TTY hardcopy	The printed page copy of the low-speed radar data
475	RDR plotboard chart	Various plots, using the XY coordinate system, of spacecraft trajectory or orbital information

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Table 35-1. Data Identification Numbers (cont)

Identification Number	Item	Description
530-533	TLM mag tape rcdr No. 1 through 4	A 7- or 14-track analog mag tape recording of time and various spacecraft and ground station functions. Track assignments are listed in Section 57 of these supplements.
550-553	TLM func s/chart S/S No. 1 through 4	A stripchart recording usually containing receiver AGC's and time. Pen assignments are listed in Section 57 of these supplements.
600	USB TDP LS data PT	Output of the USB TDP in paper tape form (sent with the station data package)
630-633	USB mag tape rcdr No. 1 through 4	A 14-channel analog mag tape recording of time and various spacecraft and ground station functions. Track assignments are listed in Section 54 of these supplements.
649	USB ARA data trans mag tape	A USB mag tape, recorded at a ground station, containing data previously recorded aboard an ARIA and retransmitted to the ground
650-651	USB func s/chart rcdr No. 1 AND 2	An 8-channel stripchart with SDT. Pen assignments are listed in Section 54 of these supplements.
656	USB events s/chart	A 100- or 150-channel strip recording of specific spacecraft or ground station events. Pen assignments are listed in Section 54 of these supplements.
658-663	USB func/event s/chart No. 1 through 6	A stripchart recording of usually 17 channels (9 events and 8 functions). Pen assignments are listed in Section 54 of these supplements.
671	USB ranging data H/C	Permission check of USB system ranging delay
672	USB bit error curves	Results of IST-02 (comparison of bit errors versus signal strength)
673	USB TDP TTY hard copy	The printed page copy of the low-speed USB TDP data
676	USB spectrum photos	Polaroid photographs of an oscilloscope presentation of the USB spectrum, showing the noise and distortion present

Table 35-1. Data Identification Numbers (cont)

Identification Number	Item	Description
680	USB event time chart	A chart of time and the occurrence of on-station events (see Section 54 of the NOD)
840	Video mag tape	An analog mag tape recording of real-time and/or dump TV (two-inch tape)
890 ARA	Inst almanac	A computer printout of antenna pointing information for each ARIA for each TSP from which support is required
892	ARIA/AOCC detailed performance report	A postmission report published 30 to 45 days after the end of the mission and detailing ARIA/AOCC performance
893	ARIA controller's mission report	A postmission report of the activities of the ARIA Control Center

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35.2.4 STATION GUIDELINES

The following guidelines apply to the identification of magnetic tapes and strip charts:

- a. Magnetic Tapes. Stations with a USB capability are to use applicable numbers from the series 630-649. Stations without a USB capability are to use numbers from the series 530-549.
- b. Stripcharts. Only those stripcharts which are listed in the receiver setup tables in Section 57 of these supplements are to be assigned numbers in the 500 series.

35.2.5 MISSION DATA REQUIREMENTS

Tables 35-2, 35-3, and 35-4 list respectively the type of data available from MSFN land stations, Apollo ships, and ARIA.

Table 35-2. MSFN Land Station Data Availability

DSS ID No. and Systems Data Listing	Facilities															
	ACN	ANG	BDA	CAL	CRO	CYI	GBM	GDS	GWM	GYM	HAW	HSK	MAD	MIL	TAN	TEX
<u>C-band Radar</u>																
400 LS Data PT			X	X	X						X				X	
430 Magnetic Tape			X	X	X						X				X	
450 Func S/Chart			X								X				X	
456 Event S/Chart			X													
458 Func/Event S/Chart			X	X	X											
470 PLIM Data Sheet			X	X	X						X				X	
<u>Telemetry</u>																
530 Mag Tape Rcdr No. 1															X	
531 Mag Tape Rcdr No. 2															X	
550 Func S/Chart S/S1	X	X	X		X	X	X		X	X	X			X	X	X
551 Func S/Chart S/S2		X	X		X						X			X		
552 Func S/Chart S/S2			X												X	X
554 EVENT S/CHART.																
570 PLIM Data Sheet (PCM)	X	X	X		X	X	X	X	X	X	X	X	X	X		X
<u>Sta and S/C Comm</u>	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
330 Com Mag Tape	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
350 Com S/Chart																X
370 PLIM Data Sheet S/C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
371 PLIM Data Sheet GCC	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
556 MIL S/Chart																
<u>Command</u>																
231 History Mag Tape	X	X	X		X	X	X	X	X	X	X	X	X	X		X
256 Event S/Chart														X		
273 History TTY H/C	X	X	X		X	X	X	X	X	X	X	X	X	X		X
274 History Tab	X	X	X		X	X	X	X	X	X	X	X	X	X		X
<u>USB</u>																
600 LS Data PT	X	X	X		X	X	X	X	X	X	X	X	X	X		X
630 Mag Tape Rcdr No. 1	X	X	X		X	X	X	X	X	X	X	X	X	X		X
631 Mag Tape Rcdr No. 2	X	X	X		X	X	X	X	X	X	X	X	X	X		X
632 Mag Tape Rcdr No. 3		X	X					X				X	X	X		

Table 35-2. MSFN Land Station Data Availability (cont)

DSS ID No. and Systems Data Listing	Facilities	ACN	ANG	BDA	CAL	CRO	CYI	GBM	GDS	GWM	GYM	HAW	HSK	MAD	MIL	TAN	TEX
<u>USB (cont)</u>																	
633 Mag Tape Rcdr No. 4									X				X	X	X		
634 Mag Tape Rcdr No. 5																	
650 Func S/Chart Rcdr 1	X		X			X	X	X	X	X	X	X	X	X	X		X
656 Event S/Chart	X	X	X			X	X	X	X	X	X	X	X	X	X		X
658 Func/Event S/Chart No. 1	X	X	X			X	X	X	X	X	X	X	X	X	X		X
659 Func/Event S/Chart No. 2	X	X	X			X	X	X	X	X	X	X	X	X	X		
660 Func/Event S/Chart No. 3	X	X	X			X	X	X	X	X	X	X	X	X	X		X
670 PLIM Data Sheet	X	X	X			X	X	X	X	X	X	X	X	X	X		X
671 Ranging Data	X	X	X			X	X	X	X	X	X	X	X	X	X		X
673 TDP TTY H/C	X	X	X			X	X	X	X	X	X	X	X	X	X		X
680 EVENT TIME SHEET	X	X	X			X	X	X	X	X	X	X	X	X	X		X
<u>Acq Aid</u>																	
50 S/Chart	X	X	X	X	X	X	X			X	X	X			X	X	X
70 PLIM Data Sheet COMPUTER COMPLEX.	X	X	X	X	X	X	X			X	X	X			X	X	X
170 PLIM Data Sheet (C-C)	X	X	X			X	X		X	X	X	X	X	X	X		X
TV.									X				X	X			
840 VIDEO MAG TAPE.																	

Table 35-3. Ships Data Availability

DSS ID No. and Systems Data Listing	Ships	HTV	MER	RED	VAN
<u>Acq Aid</u>					
070 PLIM Data Sheets		X	X	X	X
<u>Computers</u>					
150 Discrete 8-Ch S/Chart			X	X	X
130 Raw Data Mag Tape			X	X	X
131 Log Mag Tape	X		X	X	X
171 PLIM Data Sheets CDP	X		X	X	X
174 Cmptr HS Printer			X	X	X
<u>Command</u>					
231 History Mag Tape			X	X	X
250 Func S/Chart			X	X	X
256 Event S/Chart			X	X	X
270 PLIM Data Sheets			X	X	X
273 History TTY H/C			X	X	X
274 History TAB			X	X	X
<u>Communications</u>					
330 A/G Mag Tape	X		X	X	X
370 PLIM Data Sheets S/C	X		X	X	X
371 PLIM Data Sheets GCC	X		X	X	X
<u>C-band Radar</u>					
400 LS Data PT	X		X	X	X
450 Func S/Chart	X		X	X	X
470 PLIM Data Sheets	X		X	X	X
473 LS Data TTY H/C	X		X	X	X
<u>Telemetry</u>					
550 Func S/Chart S/S 1	X		X	X	X
551 Func S/Chart S/S 2			X	X	X
570 PLIM Data Sheets PCM	X		X	X	X

Table 35-3. Ships Data Availability (cont)

DSS ID No. and Systems Data Listing	Ships	HTV	MER	RED	VAN
<u>Unified S-band</u>					
600 LS Data PT		X	X	X	X
630 Mag Tape		X	X	X	X
631 Mag Tape		X	X	X	X
656 Event S/Chart		X	X	X	X
658 Func/Event S/Chart 1		X	X	X	X
659 Func/Event S/Chart 2		X	X	X	X
660 Func/Event S/Chart 3		X	X	X	X
670 PLIM Data Sheet		X	X	X	X
671 Ranging Data H/C		X	X	X	X
673 LS/TTY H/C		X	X	X	X

Table 35-4. ARIA Data Availability

DSS ID No. and Systems Data Listing	Facilities	ARIA 1-8	AOCC	X-Y Bldg	ARIA Recording
<u>Premission Data</u>					
630 USB Mag Tape Redr 1\$		X			
631 USB Mag Tape Redr 2\$		X			
890 Inst Almanac			X		
330 Comm A/G Mag Tape		X		X	
630 USB Mag Tape Redr 1		X			
631 USB Mag Tape Redr 2		X			
649 USB Data Xfer Mag Tape					X
870 PLIM Data Sheet			X		
882 AFETR Form 40 Six Sheets		X			
893 Controller's Report			X		
894 USB Voice Cal Test Data via TTY		X			
892 ARIA/AOCC Detailed Perf Report			X		

\$ = bit error rate test

35.3 SPECIAL HANDLING INSTRUCTIONS

35.3.1 thru 35.3.3 N/A TO HSK

35.3.4 HSK AND MAD ARE TO HOLD ALL WING SITE DATA UNTIL EOM AND THEN SHIP TO GSFC/DSS. PRIME SITE DATA IS TO BE SHIPPED TO GSFC/DSS EVERY 24 HOURS.

35.3.5 thru 35.3.19 N/A TO HSK

35.3.20 GDS MAR'S 210' N/A TO HSK

35.3.21 PARKES 210 RECORDED DATA IS TO BE HAND CARRIED TO GSFC/DSS BY RETURNING GSFC PERSONNEL.

35.3.22 ALL SITES ARE TO HOLD ALL LOW SPEED DATA PAPER TAPES ON SITE UNTIL EOM PLUS 30 DAYS. IF TAPES ARE NOT REQUESTED PRIOR TO EOM PLUS 30 THEY MAY BE DISPOSED OF IN ACCORDANCE WITH EXISTING SITE POLICIES.

35.3.23 GDS IS TO RETAIN T.V. VIDEO MAG TAPES DSS 340 ON SITE UNTIL EOM PLUS 7 DAYS AND THEN SHIP TO GSFC/DSS.

SECTION 36.

AS - 506 MISSION SUPPLEMENTS.

PARKES 210 FOOT ANTENNA SUPPORT



PREMISSION DOCUMENTATION CHANGE NO. 18

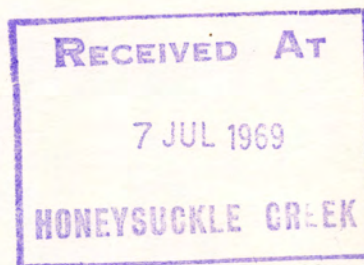
AS-506 MISSION SUPPLEMENTS

SECTION 36. PARKES, AUSTRALIA 210-FOOT

ANTENNA SUPPORT

R. S. D. P.		
1	FT	8
2		
3		
4		
5	J.K.	10/7
6	DT	8/7
7	Q.G.	8/7
8	SK	9
9		10/7
10	GRS	8/7
11		
PDC		

June 1969



This PDC covers the issuance of Section 36 to the AS-506 Mission Supplements and is effective upon receipt.

Approved by: Dale W. Call
for H. William Wood, Head
Manned Flight Operations Division

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210-FOOT ANTENNA SUPPORT

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SUPPLEMENT TO SECTION 36. PARKES, AUSTRALIA
210-FOOT ANTENNA SUPPORT

36.1 GENERAL

The Parkes, Australia 210-foot antenna facility will support the lunar surface phase of the mission and will be the prime station for LM mode 10 data which includes TV, A/G voice, PLSS biomed and TLM data. The HSK STADIR will provide the operational interface between Parkes and GSFC/MCC.

36.2 EQUIPMENT INSTALLATION AND CHECKOUT

A simplified block diagram showing equipment at Parkes, Sydney, and HSK is shown in figure 36-1. All GSFC equipment at Parkes will be installed, tested, and operated by GSFC personnel. An implementation schedule is shown in figure 36-2.

36.3 COMMUNICATIONS

36.3.1 GENERAL

To ensure best video transmission from HSK or Parkes to MCC, a TV control center at Sydney will be established. This center will have full monitoring, signal, correcting, switching, and test signal generation capability. The AS-506 Australia TV TLM System is shown in figure 36-3.

36.3.2 MICROWAVE CIRCUITS

The temporary HSK-Canberra microwave was ordered for May 1 and RFI tests at HSK were made at that time so that there would be maximum time to solve problems. These will be followed by video transmission tests to Sydney to check out the Australian system and a test from HSK to Houston at an agreeable time. The Parkes-Coonambo temporary microwave is planned to be made available July 1 to be ready for tests when the Parkes station is turned over for NASA operation.

36.3.3 VOICE/TELETYPE CIRCUITS

36.3.3.1 4-Wire Voice Coordinating Circuit. So that Parkes can operate as a wing of HSK, a 4-wire voice coordinating circuit via the Canberra Switching Center from HSK to Parkes and Sydney will be provided. This circuit will be designated as Net 7. The addition of Sydney provides for real-time video coordination. By bridging these three points at Canberra, each branch can be used independently and conferenced only as required. During the Parkes installation, this circuit can provide the means for NASA personnel to reach GSFC or MCC. The termination at Parkes must be 4-wire to make this possible.

36.3.3.2 Canberra to Parkes Voice Circuit. A second voice circuit will be available from Canberra to Parkes. This circuit will be patched to Net 1 and will give Parkes a Net 1 monitor capability.

36.3.3.3 Telex Circuit. One Telex circuit will be used between HSK and Parkes.



Figure 36-1. Equipment at Parkes, Sydney, and HSK

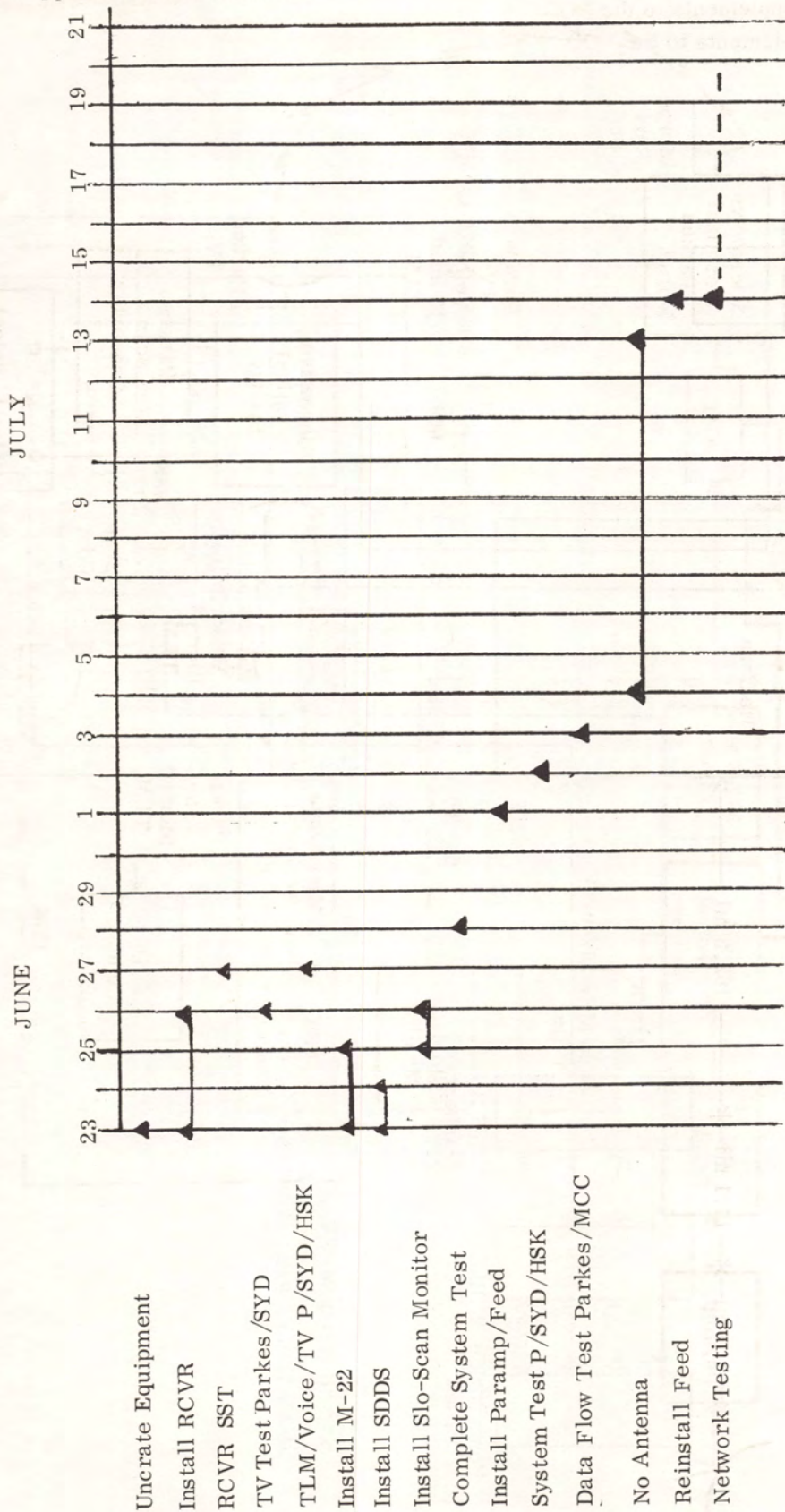


Figure 36-2. Parkes Implementation Schedule

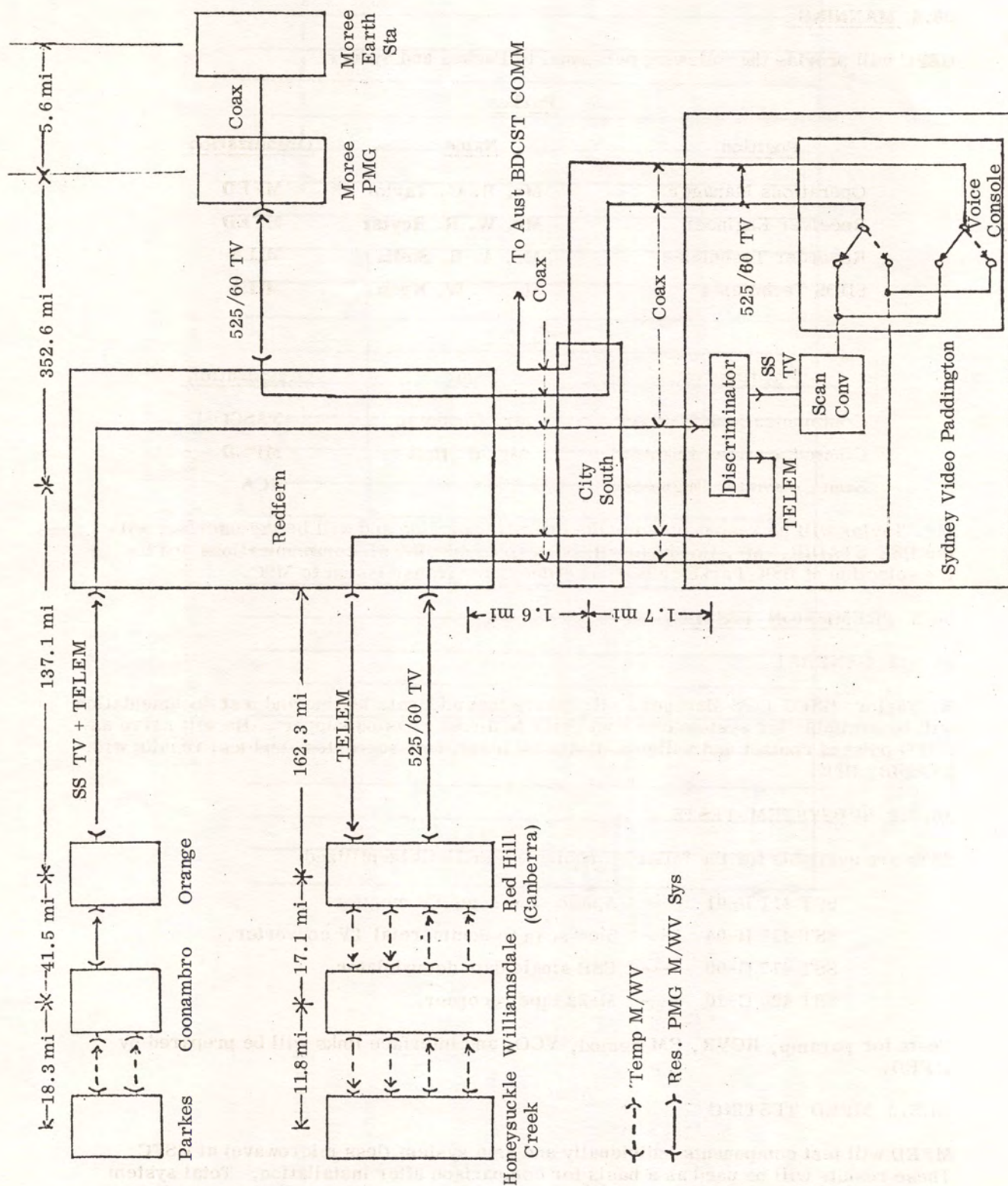


Figure 36-3. AS-506 Australia TV TLM System

36.4 MANNING

GSFC will provide the following personnel to Parkes and Sydney:

Parkes

<u>Position</u>	<u>Name</u>	<u>Organization</u>
Operations Manager	Mr. R. C. Taylor	MFED
Receiver Engineer	Mr. W. R. Reytar	MFED
Recorder Technician	Mr. A. R. Stella	MILA
SDDS Technician	Mr. G. W. Krop	MILA

Sydney

<u>Position</u>	<u>Name</u>	<u>Organization</u>
Communications Manager	Mr. Goodman	NASCOM
Communications Engineer	Mr. R. Holl	MFED
Scan Converter Engineer	-	RCA

Mr. Taylor will be responsible for the overall operation and will be the interface with the HSK STADIR. Mr. Goodman will be responsible for all communications and for the selection of HSK/Parkes video, at Sydney, for transmission to MSC.

36.5 PREMISSION TESTING

36.5.1 GENERAL

R. Taylor, GSFC OPS Manager, will ensure that adequate testing and test documentation will be available for system checkout prior to direct mission support. He will serve as GSFC point of contact and will coordinate all tests, test schedules, and test results with STADIR, HSK.

36.5.2 SUBSYSTEM TESTS

SSTs are available for the following equipment and will be utilized:

SST 411 H-01	----	Apollo slow scan TV monitor.
SST 411 H-04	----	Slow scan to commercial TV converter.
SST 417 G-00	----	USB single date demodulator.
SST 420 C-10	----	M-22 tape recorder.

Tests for paramp, RCVR, FM demod, VCO, and interface links will be prepared by MFED.

36.5.3 MFED TESTING

MFED will test components individually and as a system (less microwave) at GSFC. These results will be used as a basis for comparison after installation. Total system sensitivity will be measured on station and checked prior to CFFT, launch, and lunar support.

36.5.4 TEST EQUIPMENT

MFED will provide test equipment to check the system out and provide signal simulation. Signals to be simulated are:

<u>Type</u>	<u>Source</u>
PLSS	Tape recorder (Data recorded at MIL during FRT)
Voice	Tape recorder
TV	Bar generator (TV monitor)
PCM	AC tape for HSK/MCC test Fredric - 600 local threshold test

36.5.5 DATA FLOW INTERFACE TESTING

36.5.5.1 End-to-End Data Flow Tests. On July 3 and July 14, end-to-end data flow tests will be conducted between Parkes, Sydney switch, HSK, and MSC. The tests will consist of flowing PLSS biomed (tape data) and TLM data (AC confidence tape) from Parkes to MSC via Sydney, HSK, and GSFC. At the same time, a TV test pattern will be transmitted from Parkes to MSC via Sydney. The NOM will schedule these data flow test and generate a briefing message not later than 3 days prior to the tests.

36.5.5.2 Parkes and Sydney Data Flow Tests. Additional data flow tests will be conducted between Parkes and HSK via Sydney during the period from July 4 to July 13. These tests will be conducted to maintain confidence in the Parkes/Sydney, HSK communication during this period. However, since the S-band feed system will be removed from the antenna during this time, the test signals must be injected at the receiver instead of the paramp. These tests will be scheduled by the HSK STADIR and R. Taylor, GSFC OPS Manager.

36.5.5.3 F-2 Day SRT Interface. During the F-2 day SRT, the HSK STADIR will interface with Parkes. The timeline for the interface will be established by the HSK STADIR and R. Taylor, GSFC OPS Manager. This test will consist of a TV test pattern to Sydney and PLSS voice and PCM data to HSK. If CADFISS testing of Parkes data is required, the NOM will coordinate with the HSK STADIR. Otherwise, decom lock and 642B acceptance of data only will be validated by HSK.

36.5.5.4 H-70 Count Interface. A similar time line for interface testing will be required prior to the HSK H-70 count for the HSK/Parkes lunar support day.

36.6 MISSION SUPPORT

36.6.1 GENERAL

GSFC equipment will be operated by a group headed by R. Taylor. Prepass checklists will not be published. However, they will be prepared locally once installation is completed. This list will be checked during the H-70 count for HSK (Prime) on the day of the lunar landing.

36.6.2 PARKES STATUS

R. Taylor will send Parkes status daily through the HSK M&O. HSK will add this at the end of their STATUS MSG.

36.6.3 ACQUISITION DATA

Acquisition data has been furnished Parkes in moon/landing site tables. Offsets to these tables will be provided Parkes after MCC has determined landing site.

36.6.4 TV TRANSMISSION

HSK M&O will notify Parkes when TV transmissions are expected. Parkes will place a TV test pattern on-line one hour prior to expected TV downlink. The TV test pattern will be removed as soon as live TV is acquired.

36.6.5 TRACK ASSIGNMENTS

One M-22 tape recorder will be provided for this installation. Track assignments are as follows:

<u>Data</u>	<u>Track</u>	<u>Type</u>
Annotation	1	DIR
PLSS/voice	9	DIR
TV	8	FM
TLM PCM	7	FM
FM AGC	10	FM

Additional recordings or redundant recording of data may be made on spare channels with tape labels properly annotated.

36.6.6 RECORDER SPEEDS

Recorder TECH may vary recorder speed consistent with data, on the same reel.

1.6 kbps	15 ips
51.2 kbps	30 ips
TV	120 ips

Proper annotation should be made on tape label.

36.6.7 DATA SHIPMENT

All recorded data should be shipped air freight to:

Goddard Space Flight Center
Data Services Section
Code 824.3
Greenbelt, Maryland 20771

36.6.8 MISSION RELEASE

NOM will send mission release messages for Parkes through HSK M&O as soon as Parkes' total support is completed.

Supplement to Section 40
Station Operating Procedures

SUPPLEMENT TO SECTION 40. STATION OPERATING PROCEDURES

40.1 M&O OPERATING AND CONTINGENCY PROCEDURES

40.1.1 SPACECRAFT (S/C) TELEVISION

Television will be received from the S/C as indicated in the SCM. Stations with a remoting capability will remote video transmissions to MCC. All other stations will monitor and record the transmissions as required by Section 57 of these supplements.

40.1.1.1 On-Station TV Operating Procedures

a. A slow-scan converted stairstep (or the equivalent) test signal should be output to the remote station longline video circuit interface. The test signal should be activated at least 1 hour before the onboard video downlink and continued until the converter locks on the onboard camera. The video signal output should be 1 volt peak-to-peak with 0.7-volt video and 0.3-volt sync at all times.

~~Note~~

~~The telephone company will use this signal to set their line level.~~

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b. The longline video circuit to MCC will be activated one-half hour before the onboard video downlink. Immediately after video circuit activation (station) Video and Houston TV (MCC TV editor) will perform a video level check on Net 2.

Note

MCC will notify GDS and the telephone company at least 3 hours before impending TV transmissions.

c. Upon acquisition of the downlink video signal, the station TV operator should report "acquisition of video signal" to the M&O, remove the test pattern, and remote the S/C video to MCC. The M&O will announce "TV on line" on Net 2. Any loss of video signal output to MCC during the period of downlink should be immediately reported to the MCC TV editor on Net 2.

Note

MAD should use the above procedures only on a satellite availability basis. MAD should check with the communications manager to see when coverage is available.

d. The best TV source is to be put on line to MCC. This data is required for real-time analysis by MCC flight controllers in the event of a S/C TV anomaly.

e. When a station is remoting TV to MCC, station personnel will not edit (inhibit) the TV downlink.

40.1.1.2 Responsibilities

a. The MCC TV editor is responsible for all MCC television.

- b. The station M&O is responsible for station video.
- c. The slow-scan TV technician will coordinate TV tests and TV reception with the MCC TV editor on Net 2.

40.1.1.3 Call Signs

- a. The MCC TV editor will respond to the call sign, "Houston TV."
- b. The station slow-scan converter operator will respond to the call sign "(station) video".

40.1.2 SITE CONFIGURATION MESSAGES (SCM)

40.1.2.1 Launch Phase. Prior to launch, Track will send up to five SCMs to each launch phase station. Stations will receive only those SCMs which apply to them (as indicated in the terminal count briefing message). SCMs will be titled and used according to the following launch azimuths:

<u>SCM Title</u>	<u>Applicability</u>
72°	72° to 76°
81°	77° to 85°
90°	86° to 94°
99°	95° to 103°
108°	104° to 108°

The NC announcement of launch azimuth will determine the SCM to be used.

40.1.2.2 Earth-Orbital Phase

- a. During the earth-orbital phase, SCMs will be transmitted in accordance with Section 33 of these mission supplements.
- b. A go/no-go decision for TLI will be made shortly before TLI. Consequently, stations will receive SCMs to cover both continued earth orbit and post-TLI trans-lunar trajectory. The NC will indicate to the stations on Net 2 which configuration message is to be used. In addition, the NC will send an ~~SCM~~ message to all stations advising them of the TLI burn.

40.1.2.3 Post-TLI

- a. After TLI, GET and GMT of AOS and LOS for the next view period will be indicated in the SCMs. An SCM will be sent to a supporting station prior to each of its' view periods. The SCM may contain only an initial configuration or it may contain a series of configuration changes covering the entire view period or a portion thereof. The M&O will ensure that the station is manned in sufficient time to conduct a complete H -70 count before the next acquisition period. Prior to H -30 minutes, the station will receive an initial SCM for that view period. No later than 30 minutes before an on station configuration change, the M&O will receive a new SCM.

1. The first part of the report is a summary of the work done during the last year. It is a very brief summary, but it gives a good idea of the work done. It is a very good summary, and it is a very good idea to have a summary of the work done during the last year.

2. The second part of the report is a description of the work done during the last year. It is a very detailed description, and it gives a good idea of the work done. It is a very good description, and it is a very good idea to have a description of the work done during the last year.

3. The third part of the report is a description of the work done during the last year. It is a very detailed description, and it gives a good idea of the work done. It is a very good description, and it is a very good idea to have a description of the work done during the last year.

4. The fourth part of the report is a description of the work done during the last year. It is a very detailed description, and it gives a good idea of the work done. It is a very good description, and it is a very good idea to have a description of the work done during the last year.

5. The fifth part of the report is a description of the work done during the last year. It is a very detailed description, and it gives a good idea of the work done. It is a very good description, and it is a very good idea to have a description of the work done during the last year.

6. The sixth part of the report is a description of the work done during the last year. It is a very detailed description, and it gives a good idea of the work done. It is a very good description, and it is a very good idea to have a description of the work done during the last year.

7. The seventh part of the report is a description of the work done during the last year. It is a very detailed description, and it gives a good idea of the work done. It is a very good description, and it is a very good idea to have a description of the work done during the last year.

8. The eighth part of the report is a description of the work done during the last year. It is a very detailed description, and it gives a good idea of the work done. It is a very good description, and it is a very good idea to have a description of the work done during the last year.

9. The ninth part of the report is a description of the work done during the last year. It is a very detailed description, and it gives a good idea of the work done. It is a very good description, and it is a very good idea to have a description of the work done during the last year.

- b. The station M&O is responsible for station video.
- c. The slow-scan TV technician will coordinate TV tests and TV reception with the MCC TV editor on Net 2.

40.1.1.3 Call Signs

- a. The MCC TV editor will respond to the call sign, "Houston TV."
- b. The station slow-scan converter operator will respond to the call sign "(station) video".

40.1.2 SITE CONFIGURATION MESSAGES (SCM)

40.1.2.1 Launch Phase. Prior to launch, Track will send up to five SCMs to each launch phase station. Stations will receive only those SCMs which apply to them (as indicated in the terminal count briefing message). SCMs will be titled and used according to the following launch azimuths:

<u>SCM Title</u>	<u>Applicability</u>
72°	72° to 76°
81°	77° to 85°
90°	86° to 94°
99°	95° to 103°
108°	104° to 108°

The NC announcement of launch azimuth will determine the SCM to be used.

40.1.2.2 Earth-Orbital Phase

- a. During the earth-orbital phase, SCMs will be transmitted in accordance with Section 33 of these mission supplements.
- b. A go/no-go decision for TLI will be made shortly before TLI. Consequently, stations will receive SCMs to cover both continued earth orbit and post-TLI trans-lunar trajectory. The NC will indicate to the stations on Net 2 which configuration message is to be used. In addition, the NC will send an [REDACTED] message to all stations advising them of the TLI burn. SPE

40.1.2.3 Post-TLI

- a. After TLI, GET and GMT of AOS and LOS for the next view period will be indicated in the SCMs. An SCM will be sent to a supporting station prior to each of its' view periods. The SCM may contain only an initial configuration or it may contain a series of configuration changes covering the entire view period or a portion thereof. The M&O will ensure that the station is manned in sufficient time to conduct a complete H -70 count before the next acquisition period. Prior to H -30 minutes, the station will receive an initial SCM for that view period. No later than 30 minutes before an on station configuration change, the M&O will receive a new SCM.

The TLI SPE will include certain command parameter changes to be entered into the command computer at specific times. Stations having two-way lock with a vehicle at the time these changes are to be made, will obtain clearance from the NC before going to mode 1/M&O mode to make the required changes.

PDC #3

SITE RELEASE MSG

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Pdc#3 (1) IF IT IS NECESSARY FOR TRACK TO NOTIFY STATIONS VERBALLY OF A SPACECRAFT DOWNLINK MODE CHANGE, THE NOTIFICATION WILL BE ADDRESSED TO AND ACKNOWLEDGED BY THE 2-WAY AND BACK-UP STATIONS ASSIGNED TO THAT VEHICLE.

b. After TLI, and until reentry, the SCM will include only those items which are applicable to translunar distances (VHF and C-band are deleted). Should a change in station support configuration be requested, a new SCM will be sent to the station. The following procedures will be observed:

(1) EXCEPT FOR CASES WHERE A CONTINGENCY (VOICE) HANDOVER IS REQUIRED, ALL CARRIER ON AND OFF TIMES WILL BE DIRECTED BY SCM. Pdc#3

(2) The configuration change will be executed at the GET specified in the SCM and will remain in effect until a new SCM or verbal change is received. For example, if the new SCM indicates an uplink mode and the previous one indicated no uplink mode, the carrier will be activated at the GET specified in the latest SCM.

c. Some requests for ^{Configuration changes} ~~mode changes~~, will be made verbally by Track without transmitting an SCM. Acknowledgement of these requests will be made verbally by the M&O. Pdc#3

d. All post TLI SCMs will be acknowledge via TTY to HNET. The acknowledgement will include the DTG of the SCM. If the acknowledgement is not received prior to support time -15 minutes, Track will query the station.

e. During TLC, stations may be directed by SCM to monitor the LM downlink frequency. There will be no downlink present unless the S/C crew is required to enter the LM and "power up" to establish voice communications with MCC. In such event the M&O will immediately notify the NC on Net 2.

40.1.2.4 Prime/Wing Handovers

a. Scheduled handovers between the prime and wing stations will be noted on the SCM by a change in the uplink mode from system 1 or 2 to system 3 or 4.

b. Prime/wing handovers will be conducted in accordance with Section 40 of the NOD.

40.1.3 GDS 210-FOOT MARS HSK 210-FOOT PARKES ANTENNAS

When support from the 210-ft. antennas is required, it will be designated as system 5 in the respective SCM. The GDS M&O is the interface between the MARS station and MCC/GSFC. The HSK M&O will interface with Parkes and MCC/GSFC for A/G voice and TLM. HSK Parkes TV interface will be controlled and interfaced by the NASCOM representative at Sidney switch. Pdc#3

40.1.4 MIL CRF READOUT (PRELAUNCH)

MIL will record CRF readouts for the CSM, LM, and IU and send them via teletype to GCTR/NOM at the appropriate times designated in the terminal count. Refer to Section 33 of these mission supplements for the message format.

40.1.5 NOMINAL ACQUISITION MESSAGES

40.1.5.1 Earth-Orbital Phase. GSFC will transmit nominal acquisition messages at F-7 days. At launch, stations will select the acquisition message that corresponds to the launch azimuth announced by the NC at approximately T-14 minutes on Net 2, and in the verbal GMT-of-liftoff announcement. To ensure that stations have selected the proper acquisition message, the NOM will notify them, over Net 3, of the correct acquisition message.

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40.1.5.2 Post-TLI Acquisition Messages

- a. GSFC/GRTS will generate "no burn" acquisition messages for those stations having AOS within 30 minutes of the planned TLI. These messages will be used if TLI does not occur.
- b. MCC/RTCC will generate acquisition messages, taking into account a nominal TLI burn. The NC will announce on Net 2 whether or not a successful TLI has occurred, and which acquisition message will be used.
- c. If a planned TLI does not occur, the maneuver will be removed from the ephemeris in MCC/RTCC and acquisition messages will be generated for those stations not already in acquisition. Network will advise affected stations as to which acquisition message to use. MCC/RTCC will then return to normal acquisition message generation and stations will receive only the MCC/RTCC-generated messages.

40.1.6 HANDOVER ANNOUNCEMENT (POST-TLI)

No later than 3 minutes before a handover, MCC will announce on Net 2 that a handover is imminent. The information in the announcement will include:

- a. The station handing over
- b. The station going two-way
- c. The GET of the handover
- d. The S/C involved
- e. The active S/C antenna (omni or high-gain) which will dictate the handover procedure to be used.

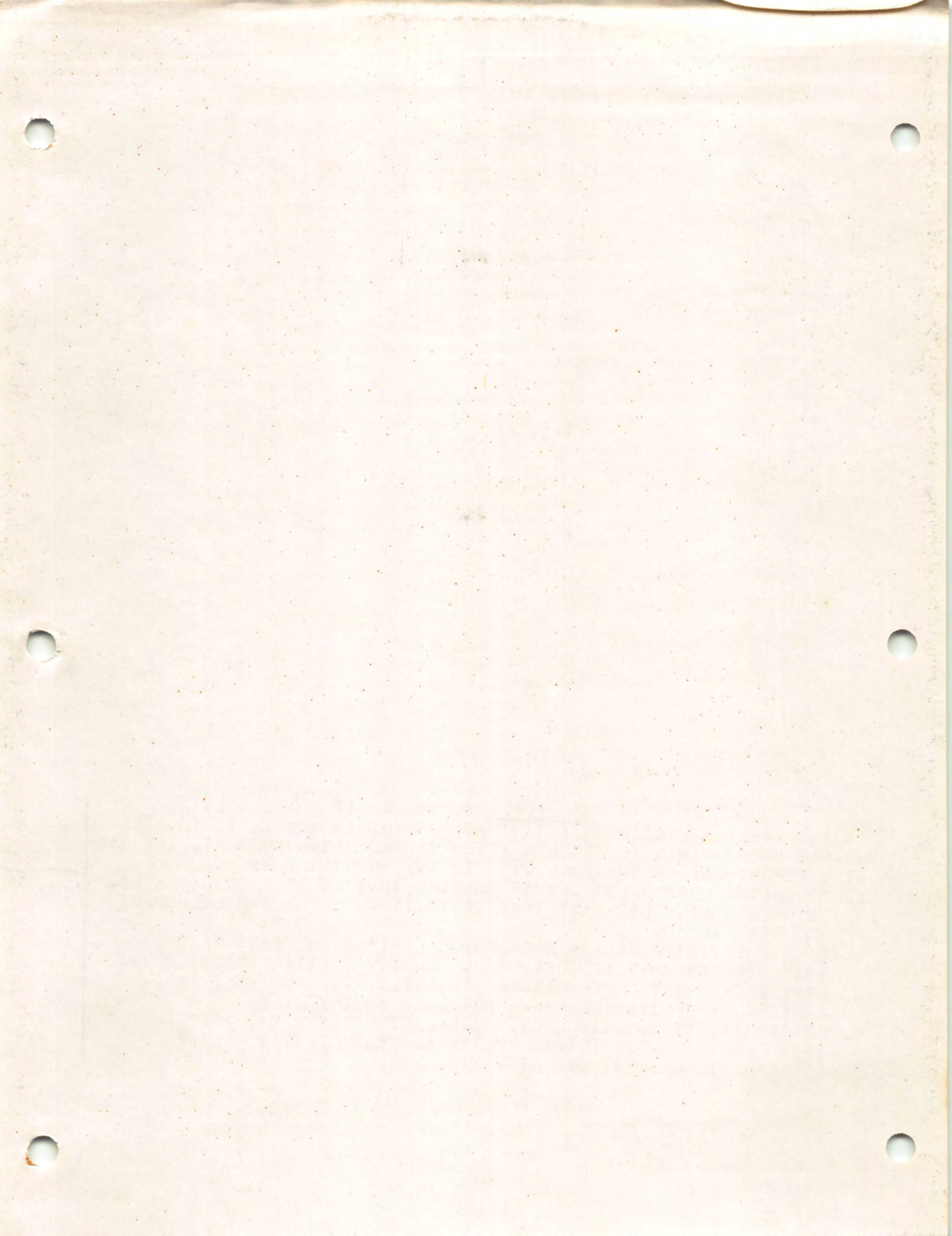
40.1.7 STATIONS IN TWO-WAY CONFIGURATION - CONTINGENCY HANDOVER (ALL)

- a. The M&O will conduct a handover immediately, should systems with the same vehicle assignments experience an equipment failure that prevents uplinking to the assigned vehicle to a specific system, e.g., system 1 - LM (active), system 2 - LM, systems 3 XXXX CSM, and system 4 CSM. If system 1 fails, the M&O will go active on system 2. (Program track may be used subject to limitation in paragraph 54.4.8.3 of the NOD).

Note

If the M&O does not know what S/C antenna is being used, he will assume that the high-gain antenna is in use and make a high-gain antenna type of handover.

B. UNLESS OTHERWISE DIRECTED BY TRACK, THE SYSTEM ACCEPTING THE TRACKING RESPONSIBILITY WILL CONFIGURE IN ACCORDANCE WITH THE SCM FOR THE SYSTEM HANDING OVER. LOW SPEED TRACKING DATA WILL BE INHIBITED DURING THE HANDOVER WHEN THE HANDOVER REQUIRES CHANGING TRACKING DATA PROCESSORS (TDP). A NEW START OF MESSAGE WILL BE INITIATED AFTER THE HANDOVER IS COMPLETED, UPON DIRECTION OF TRACK (EXCEPT WHEN H/S TRACKING DATA IS BEING TRANSMITTED).



40.1.2.4 (LUNAR ORBIT PHASE ONLY)

IN THE EVENT AN ACTIVE STATION HAS AOS BUT IS UNABLE TO ACQUIRE TWO-WAY LOCK WITHIN 30 SECONDS AFTER THE AOS ANNOUNCEMENT, THE M&O WILL REPORT ONE OF THE FOLLOWING TO THE NC ON NET 2:

- A. "DOWNLINK LOCK ONLY" - THIS DENOTES THAT A RECEIVER HAS ACHIEVED DOWN LINK LOCK AND THAT INDICATIONS OF UPLINK LOCK HAVE NOT BEEN ACHIEVED.
- B. "INTERMITTENT DOWNLINK LOCK, SIGNAL STRENGTH MINUS XXX" - THIS DENOTES THAT A RECEIVER HAS ACHIEVED INTERMITTENT DOWNLINK LOCK DUE TO WEAK SIGNAL STRENGTH, ETC. AND THAT INDICATIONS OF UPLINK LOCK HAVE NOT BEEN ACHIEVED.
- C. "INTERMITTENT TWO-WAY LOCK, SIGNAL STRENGTH MINUS XXX" - THIS DENOTES INTERMITTENT UPLINK AND RESULTANT DOWNLINK LOCK DUE TO WEAK SIGNAL STRENGTH, ETC.

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c. After the handover has been performed, the M&O will report the following to Network on Net 2:

- (1) Time of handover
- (2) Nature of failure(s)
- (3) ETO of Red equipment
- (4) Time (GET) of two-way lock (go for command)
- (5) Status of second facility; i.e., able/unable to three-way track (vehicle).

Note

If the original system problem is repaired, the M&O will not handover back to the original system without first coordinating with Track on Net 2.

40.1.8 AOS AND LOS ANNOUNCEMENTS

40.1.8.1 Throughout the entire mission, stations will announce their initial AOS and final LOS as required by the NOD.

Note

Announcements of "go for CMD" should be made only after reasonable assurance of solid S/C two-way lock to preclude multiple announcements (i.e., "go - unable - go-----etc".) Solid lock will be based on real-time M&O evaluation of such factors as station terrain screening and historical RF multipath probability.

40.1.8.2 After TLI and during multi-station acquisition, only the two-way station and the backup station, as indicated in the SCM notes, will announce an AOS or LOS resulting from Passive Thermal Control (PTC), lunar occultation and emergence, or a low-signal level causing all stations to lose lock.

40.1.8.3 In the event of AOS due to early emergence, the first station to acquire will announce on Net 2 "(station) AOS (vehicle)". Other stations, except designated prime and backup stations, should refrain from making this announcement after hearing the original station on Net 2.

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40.1.9 LOS REPORTS (EARLY MISSION TERMINATION)

Stations which are in acquisition during reentry, resulting from an abort or early mission termination, are to report the following to the NC on Net 2:

- a. One minute to LOS, based on the M&O estimate
- b. Actual time (GMT) and USB and/or C-band azimuth at LOS.

40.1.10 TYPICAL ACTIVITIES (LUNAR ORBIT)

The following tabulation presents typical station activities during a lunar orbit:

STATION
PAGE

<u>Time</u>	<u>Station</u>	<u>Personnel</u>	<u>Activities</u>
LOS (Occultation) plus 2 minutes	Two-way and backup	USB and Recorders	Annotate recorders to reflect mission phase
	Two-way	Exciter tech	Inhibit modulation
	85 ft	Servo tech	Select program mode (lunar-track tape)
	Two-way	Com tech	Inhibit downlink voice
Predicted AOS minus 15 minutes	All	M&O	Confirm all positions manned
	Two-way	R&E tech	Begin sweeping uplink
AOS minus 2 minutes	All	APP tech	Select computer drive (CSM or LM acq message) and load nominal acq message into APP and begin operation
AOS	Two-way and backup	M&O	Make AOS announcement
Downlink lock	All	Servo tech	Select autotrack mode
Two-way lock	Two-way	Exciter tech	Apply modulation
	Two-way	Com tech	Enable downlink voice
	Two-way	M&O	Make go for CMD announcements as applicable

40.2 USB PROCEDURES

40.2.1 SPACECRAFT ANTENNA USAGE

After TLI (during PTC) and up to approximately 140,000 nmi, normal communication with the CSM will be obtained by using the omni antennas. When the crew is sleeping, MCC will be switching omni antennas (B and D) by command; otherwise, the crew will switch antennas. Tape dumps and TV will require the high-gain antenna. Beyond 140,000 nmi, the high-gain antenna will be prime. It is expected that high-gain antenna lock will be maintained even during PTC using the MSFN stations and the high-gain handover.

40.2.2 POST-TLI RANGING

40.2.2.1 General. During lunar phases, the two-way stations will re-establish PRN ranging in accordance with the following procedures:

- a. The SCM will normally reflect ranging modes (Modes 1, 4, 5, 6, or 8). However, if the station receives an SCM that does not indicate a ranging mode, the M&O will ensure that the Ranging tech does not initiate ranging. If MCC requests ranging and the SCM does not give a ranging mode, the M&O should query Track as to which ranging mode is required.

ACTIVITY REPORT

The following table shows the results of the activity report for the month of January 1971.

Activity	Category	Value
1.00	1.00	1.00
2.00	2.00	2.00
3.00	3.00	3.00
4.00	4.00	4.00
5.00	5.00	5.00
6.00	6.00	6.00
7.00	7.00	7.00
8.00	8.00	8.00
9.00	9.00	9.00
10.00	10.00	10.00
11.00	11.00	11.00
12.00	12.00	12.00
13.00	13.00	13.00
14.00	14.00	14.00
15.00	15.00	15.00
16.00	16.00	16.00
17.00	17.00	17.00
18.00	18.00	18.00
19.00	19.00	19.00
20.00	20.00	20.00
21.00	21.00	21.00
22.00	22.00	22.00
23.00	23.00	23.00
24.00	24.00	24.00
25.00	25.00	25.00
26.00	26.00	26.00
27.00	27.00	27.00
28.00	28.00	28.00
29.00	29.00	29.00
30.00	30.00	30.00
31.00	31.00	31.00
32.00	32.00	32.00
33.00	33.00	33.00
34.00	34.00	34.00
35.00	35.00	35.00
36.00	36.00	36.00
37.00	37.00	37.00
38.00	38.00	38.00
39.00	39.00	39.00
40.00	40.00	40.00
41.00	41.00	41.00
42.00	42.00	42.00
43.00	43.00	43.00
44.00	44.00	44.00
45.00	45.00	45.00
46.00	46.00	46.00
47.00	47.00	47.00
48.00	48.00	48.00
49.00	49.00	49.00
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79.00	79.00	79.00
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87.00	87.00	87.00
88.00	88.00	88.00
89.00	89.00	89.00
90.00	90.00	90.00
91.00	91.00	91.00
92.00	92.00	92.00
93.00	93.00	93.00
94.00	94.00	94.00
95.00	95.00	95.00
96.00	96.00	96.00
97.00	97.00	97.00
98.00	98.00	98.00
99.00	99.00	99.00
100.00	100.00	100.00

The total value of the activity report for the month of January 1971 is 100.00.

The activity report for the month of January 1971 is complete.

The activity report for the month of January 1971 is complete.

The activity report for the month of January 1971 is complete.

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40.1.10 TYPICAL ACTIVITIES (LUNAR ORBIT)

The following tabulation presents typical station activities during a lunar orbit:

<u>Time</u>	<u>Station</u>	<u>Personnel</u>	<u>Activities</u>
LOS (Occultation) plus 2 minutes	Two-way and backup	USB and Recorders	Annotate recorders to reflect mission phase
	Two-way	Exciter tech	Inhibit modulation
	85 ft	Servo tech	Select program mode (lunar-track tape)
	Two-way	Com tech	Inhibit downlink voice
Predicted AOS minus 15 minutes	All	M&O	Confirm all positions manned
	Two-way	R&E tech	Begin sweeping uplink
AOS minus 2 minutes	All	APP tech	Select computer drive (CSM or LM acq message) and load nominal acq message into APP and begin operation
AOS	Two-way and backup	M&O	Make AOS announcement
Downlink lock	All	Servo tech	Select autotrack mode
Two-way lock	Two-way	Exciter tech	Apply modulation
	Two-way	Com tech	Enable downlink voice
	Two-way	M&O	Make go for CMD announcements as applicable

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40.2 USB PROCEDURES

40.2.1 SPACECRAFT ANTENNA USAGE

After TLI (during PTC) and up to approximately 140,000 nmi, normal communication with the CSM will be obtained by using the omni antennas. When the crew is sleeping, MCC will be switching omni antennas (B and D) by command; otherwise, the crew will switch antennas. Tape dumps and TV will require the high-gain antenna. Beyond 140,000 nmi, the high-gain antenna will be prime. It is expected that high-gain antenna lock will be maintained even during PTC using the MSFN stations and the high-gain handover.

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40.2.2 POST-TLI RANGING

40.2.2.1 General. During lunar phases, the two-way stations will re-establish PRN ranging in accordance with the following procedures:

- a. The SCM will normally reflect ranging modes (Modes 1, 4, 5, 6, or 8). However, if the station receives an SCM that does not indicate a ranging mode, the M&O will ensure that the Ranging tech does not initiate ranging. If MCC requests ranging and the SCM does not give a ranging mode, the M&O should query Track as to which ranging mode is required.

40.1.11 SIMULTANEOUS EASEP/APOLLO SUPPORT (CRO AND HSK ONLY)

40.1.11.1 CRO ^{HSK} AND/OR ^{MIL} ~~HSK~~ WILL BE REQUIRED TO SUPPORT THE EASEP TLM, CMD AND RECORDING REQUIREMENTS IN ADDITION TO LIMITED SUPPORT OF THE APOLLO MISSION.

40.1.11.2 AFTER EASEP DEPLOYMENT, CRO ^{HSK} AND/OR ^{MIL} ~~HSK~~ WILL BE SCHEDULED TO CONFIGURE SYSTEM NR 1 FOR EASEP TLM AND CMD SUPPORT AND SYSTEM NR 2 FOR APOLLO DOWNLINK A/G, TRACKING AND TLM. THESE STATIONS WILL TRANSMIT APOLLO TLM DATA VIA ONE H/S DATA LINE (AS REQUIRED) AND EASEP DATA VIA THE SECOND H/S DATA LINE. THE LM OR CSM TRACKING DATA WILL BE REMOTED TO MCC AS SPECIFIED IN THE SCM.

40.1.11.3 LONGLINE CONFIGURATION

A. VOICE/DATA LINES

NET 1- A/G VOICE

NET 2- MCC/STATION OPERATIONAL COORDINATION

NET 3- GSFC/STATION OPERATIONAL COORDINATION

NET 4- ALSEP DATA (CMD AND TLM)

NET 5- APOLLO H/S TRACKING DATA

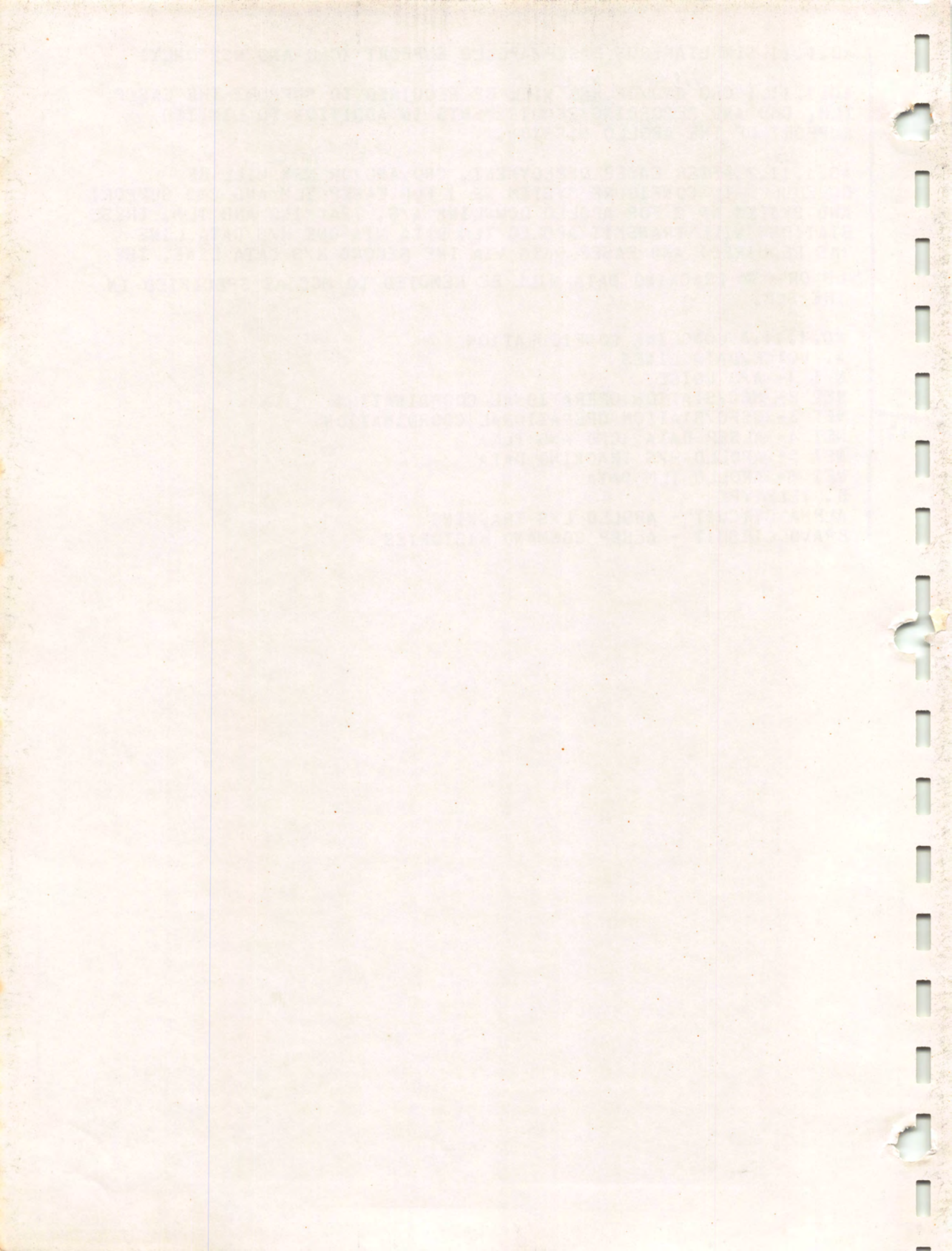
NET 6- APOLLO TLM DATA

B. TELETYPE

ALPHA CIRCUIT - APOLLO L/S TRACKING

BRAVO CIRCUIT - ALSEP COMMAND HISTORIES

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- b. If PRN ranging is initiated and no ranging turnaround from the S/C is observed, the M&O will notify Track on Net 2.
- c. It will be necessary for the M&O and USB to monitor Net 2 and GOSS conference to determine which S/C antenna (high-gain or omni) is in use.
- d. When on the omni antenna, the S/C crew will initiate voice contact during ranging periods only if necessary. Stations should be prepared to turn off the PRN and switch modes (if necessary) immediately upon hearing the S/C crew calling MCC.

Note

Track will inform the station if it becomes necessary to discontinue ranging until communications are completed. Signal strength at the ground station may be high enough to allow simultaneous communication and ranging. However, if the M&O hears the S/C crew calling, and the signal strength is low enough to cause distortion and noise, PRN ranging should be terminated immediately until communications are completed. In this case, the M&O will notify Track on Net 2. If PRN turnaround ceases and the crew begins base-band communications, the PRN should be terminated immediately at the ground station.

40.2.2.2 Ranging Procedures During Translunar/Transearth Coast

- a. High-Gain Antenna. When the S/C high-gain antenna is in use, USB stations (85-foot and 30-foot) will observe the following procedures:

- (1) Handovers

- (a) At the completion of RF acquisition (without direction from MCC), perform a successful PRN range acquisition. The Ranging tech should use his discretion in deciding if any range acquisitions of dubious quality (because of signal fluctuations, etc.) are valid.
 - (b) At the completion of a successful ranging acquisition, the Ranging tech will switch off the PRN and continue clock-updated ranging.

Note

After reacquisition, 1 minute should be allowed for communications before initiating ranging. If communications are in progress, the Ranging tech should wait until the conversation is completed.

- (2) MCC Ranging Requests. If MCC requests a range acquisition, perform a single successful PRN and continue clock-updated ranging.

- b. Omni-antenna. For stations with 85-foot antennas, the ranging procedures during omni-antenna use are the same as those for the high-gain antenna. However, if the ranging mode causes a low signal strength, the procedure should be terminated and executed only at MCC request. The M&O should notify NC on Net 2 if the ranging (PRN) causes a serious signal strength drop. At stations with 30-foot antennas, no PRN ranging will be required unless directed by MCC.

40.2.2.3 Ranging During Lunar Orbits

a. High-Gain Antenna. When the S/C high-gain antenna is in use, USB stations (85-foot and 30-foot) will implement the following procedures, upon direction from MCC:

- (1) Perform a successful PRN range acquisition. The Ranging tech should use his discretion in deciding the validity of any range results of dubious quality caused by signal fluctuations, etc.
- (2) At the completion of a valid PRN ranging acquisition, the Ranging tech will switch off the PRN and continue clock-updated ranging.

Note

MCC may also direct that the clock be turned off.

- (3) If clock-updated ranging becomes questionable because of signal fluctuations, etc., the M&O will notify Track on Net 2. However, stations will not reacquire range unless specifically directed.

Note

Stations will not initiate ranging except by direction of MCC even though the ranging capability exists on uplink mode given in SCM.

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b. Omni-antenna. There will be no ranging requirements during S/C omni-antenna use if the Doppler-only solution is satisfactory. Any ranging requirement will be directed by MCC.

40.2.3 EARLY AOS DUE TO UNPLANNED RETURN FROM LUNAR ORBITS (STATIONS WITH 85-FOOT ANTENNAS ONLY)

40.2.3.1 General

- a. If the S/C crew elects to return on any lunar orbit other than as planned, station AOS will occur approximately 13 minutes early. The M&O will ensure that the station is ready for all AOS activities (A/G remoting, etc.).
- b. If the S/C crew elects not to go into lunar orbit, an early AOS from the first occultation will result.

40.2.3.2 Lunar Track Acquisition Messages

- a. GSFC will generate and transmit (to all stations) the lunar track acquisition messages. These messages will cover the station's view period of the moon on each day. The messages will be for tracking the expected point of emergence for the spacecraft.
- b. Whenever the moon-track messages are used, USB should compare the actual antenna track with visual sightings, weather permitting. If the program track becomes erroneous, the Servo tech should reposition the antenna and manually track the expected point of emergence.
- c. Before the S/C enters lunar orbit, the 1218 operator will cut APP tapes (for moon tracking) for the day(s) that the S/C will be in lunar orbit. Each APP tape will be tagged with the correct date.

1. The purpose of this document is to provide information regarding the security of the system.

2. The system is designed to protect the confidentiality of the information stored within it.

3. The system is subject to regular security audits to ensure its integrity.

4. The system is designed to be resilient to attacks and to recover from any breaches.

5. The system is designed to be scalable and to accommodate future growth.

6. The system is designed to be secure and to protect the confidentiality of the information stored within it.

7. The system is designed to be reliable and to provide consistent performance.

8. The system is designed to be flexible and to adapt to changing requirements.

9. The system is designed to be secure and to protect the confidentiality of the information stored within it.

10. The system is designed to be resilient to attacks and to recover from any breaches.

11. The system is designed to be scalable and to accommodate future growth.

12. The system is designed to be secure and to protect the confidentiality of the information stored within it.

40.2.2.3 Ranging During Lunar Orbits

a. High-Gain Antenna. When the S/C high-gain antenna is in use, USB stations (85-foot and 30-foot) will implement the following procedures, upon direction from MCC:

(1) Perform a successful PRN range acquisition. The Ranging tech should use his discretion in deciding the validity of any range results of dubious quality caused by signal fluctuations, etc.

(2) At the completion of a valid PRN ranging acquisition, the Ranging tech will switch off the PRN and continue clock-updated ranging.

Note

MCC may also direct that the clock be turned off.

(3) If clock-updated ranging becomes questionable because of signal fluctuations, etc., the M&O will notify Track on Net 2. However, stations will not reacquire range unless specifically directed.

Note

Stations will not initiate ranging except by direction of MCC even though the ranging capability exists on uplink mode given in SCM.

b. Omni-antenna. There will be no ranging requirements during S/C omni-antenna use if the Doppler-only solution is satisfactory. Any ranging requirement will be directed by MCC.

40.2.3 EARLY AOS DUE TO UNPLANNED RETURN FROM LUNAR ORBITS
(STATIONS WITH 85-FOOT ANTENNAS ONLY)

40.2.3.1 General

a. If the S/C crew elects to return on any lunar orbit other than as planned, station AOS will occur approximately 13 minutes early. The M&O will ensure that the station is ready for all AOS activities (A/G remoting, etc.).

b. If the S/C crew elects not to go into lunar orbit, an early AOS from the first occultation will result.

40.2.3.2 Lunar Track Acquisition Messages

a. GSFC will generate and transmit (^{85 Foot} stations) the lunar track acquisition messages. These messages will cover the station's view period of the moon on each day. The messages will be for tracking the expected point of emergence for the spacecraft.

b. Whenever the moon-track messages are used, USB should compare the actual antenna track with visual sightings, weather permitting. If the program track becomes erroneous, the Servo tech should reposition the antenna and manually track the expected point of emergence.

c. Before the S/C enters lunar orbit, the 1218 operator will cut APP tapes (for moon tracking) for the day(s) that the S/C will be in lunar orbit. Each APP tape will be tagged with the correct date.

NOTE:

IN THE EVENT THAT AN 85 FOOT STATION ANNOUNCES EARLY EMERGENCE, 30 FOOT STATIONS WILL USE THEIR CENTER OF MOON TRACKING DATA AS AN AID FOR S/C ACQUISITION.

d. APP tapes will be used as follows:

- (1) At 15 minutes before LOS (of each occultation), the APP operator will load the moon-track tape and position it to the correct time (nominal LOS +2 minutes).
- (2) At LOS +2 minutes, the USB program track will be activated. The Servo tech should ensure that the antenna continues on the correct track.

Note

The antenna should swing over to the expected point of emergence and begin tracking.

- (3) When the nominal acquisition message is received for the next AOS, the 1218 operator will cut an APP tape and then reload the 1218 with the nominal acquisition message.
- (4) At H-2 minutes of the nominal AOS, the program track will be terminated and USB personnel will begin normal acquisition procedures. The APP operator will load the nominal acquisition message tape into the APP and begin operations.

40.2.4 USB DBM LEVEL REPORTING (CSM AND LM)

40.2.4.1 The USB supervisor will monitor the signal strengths of the CSM and LM PM carriers and announce on the M&O loop when the following S/S levels are 3 dbm above threshold:

Downlink

PCM HBR

PCM LBR

Down voice backup

1.25 MHz voice subcarrier

Key mode

40.2.4.2 The M&O at the two-way station will then announce the preceding signal levels on Net 2. Announcements of signal strength decrease or increase will also be made (e.g. "GDS, CSM PCM HBR level is 3 dbm above threshold and decreasing).

40.2.4.3 After TLI, two-way stations will make the dbm (S/S) level announcements as above. At different times during the mission (primarily translunar and transearth), two-way control will be transferred to a station with a 30-foot antenna. The NC may elect to request S/S announcements from a three-way station (85-foot antenna) rather than the two-way station (30-foot antenna).

40.2.5 LOW-SPEED TRACKING DATA AFTER TLI

40.2.5.1 During lunar missions, as many as 10 stations could be tracking the space vehicle simultaneously. Only six low-speed TTY lines are available for low-speed tracking data between GSFC and Houston; therefore, only six low-speed TTY tracking data inputs (six stations) can be handled simultaneously. Consequently, the SCM will reflect MCC LS data requirements and may indicate the no LS tracking data should be output. However, GSFC requires data from all stations in view. Accordingly, all stations will output TTY tracking data whenever tracking the space vehicles. If the SCM requires the transmission of LS data to MCC, a JJ header will be used. If MCC does

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not require the data, a DD header will be used. If LS data transmission is in progress when a change in routing is requested, the M&O will cue a new start-of-message with the appropriate header. The following points should be noted:

- a. The LS column on the SCM will indicate only MCC LS data requirements.
- b. No station will output static or boresight tracking data unless coordinated by track (with the exception of tracking data from CADFISS testing).
- c. All requirements for high-speed tracking data (either USB or C-band) after TLI will be indicated in the SCM notes column.

40.2.5.2 The symbol X indicates transmission to MCC with a JJ start of message. If the request for transmission occurs while data transmission is in progress with a DD routing, a new start of message is required after selecting the JJ routing. Conversely, deletion of the symbol X indicates transmission to MCC will cease with an end of message at the time indicated. A new start of message is required after a change to DD header.

40.2.6 HIGH-SPEED TRACKING DATA DURING LUNAR ORBIT

High-speed tracking data transmission will be required in real time during lunar orbit. Four stations (one 2-way and three 3-way) will send HSD simultaneously during LM maneuvers visible to the MSFN. This data will be used for the high-speed Doppler-only processing during descent and ascent phases of the lunar landing missions. All stations supporting this operation will be configured for single TDP output during HSD transmission, although they may be configured for dual TDP during the remainder of the pass. The SCMs will give direction for each change.

40.2.7 DUAL VEHICLE APP TAPES

The APP operator will receive two APP drive tapes, one for each vehicle (paragraph 40.14.2.3.f of the NOD). The APP drive tapes will be loaded on appropriate reels and the designated secondary support tape will be loaded into the APP tape reader. The primary support tape will be held in ready accessibility at the APP for contingency support.

40.2.8 HIGH-SPEED USB TRACKING DATA DURING PRELAUNCH/LAUNCH PHASE

No USB station will output high-speed tracking data from liftoff -15 minutes to liftoff except as indicated below or requested by Track.

- a. MIL will place high-speed tracking data on line at liftoff minus 5 minutes.
- b. GBM will place high-speed tracking data on line at liftoff plus 1 minute or at MIL to GBM handover, whichever occurs first.
- c. BDA, ANG, and VAN will place data on line at H -2 minutes

40.3 TELEMETRY BIOMED DATA REMOTING PROCEDURES

40.3.1 EARTH-ORBITAL PHASE

From launch to TLI, or for the duration of the mission if injection should not occur, stations will remote biomed data in accordance with Section 40 of the NOD.

40.3.2 POST-TLI

Normally, the station which is two-way on the CSM or LM will remote biomed data to MCC. TIC may request three-way stations to output biomed or FM data as the need arises. Remoting procedures are given in the following subparagraphs.

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not require the data, a DD header will be used. If LS data transmission is in progress when a change in routing is requested, the M&O will cue a new start-of-message with the appropriate header. The following points should be noted:

- a. The LS column on the SCM will indicate only MCC LS data requirements.
- b. No station will output static or boresight tracking data unless coordinated by track (with the exception of tracking data from CADFISS testing).
- c. All requirements for high-speed tracking data (either USB or C-band) after TLI will be indicated in the SCM notes column.

40.2.5.2 The symbol X indicates transmission to MCC with a JJ start of message. If the request for transmission occurs while data transmission is in progress with a DD routing, a new start of message is required after selecting the JJ routing. Conversely, deletion of the symbol X indicates transmission to MCC will cease with an end of message at the time indicated. A new start of message is required after a change to DD header.

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40.2.7 DUAL VEHICLE APP TAPES

The APP operator will receive two APP drive tapes, one for each vehicle (paragraph 40.14.2.3.f of the NOD). The APP drive tapes will be loaded on appropriate reels and the designated secondary support tape will be loaded into the APP tape reader. The primary support tape will be held in ready accessibility at the APP for contingency support.

40.2.8 HIGH-SPEED USB TRACKING DATA DURING PRELAUNCH/LAUNCH PHASE

No USB station will output high-speed tracking data from liftoff -15 minutes to liftoff except as indicated below or requested by Track.

- a. MIL will place high-speed tracking data on line at liftoff minus 5 minutes.
- b. GBM will place high-speed tracking data on line at liftoff plus 1 minute or at MIL to GBM handover, whichever occurs first.
- c. BDA, ANG, and VAN will place data on line at H -2 minutes

40.3 TELEMETRY BIOMED DATA REMOTING PROCEDURES

40.3.1 EARTH-ORBITAL PHASE

From launch to TLI, or for the duration of the mission if injection should not occur, stations will remote biomed data in accordance with Section 40 of the NOD.

40.3.2 POST-TLI THE STATIONS WHICH ARE TWO-WAY OR BACKUP ON THE CSM OR LM WILL REMOTE BIOMED DATA TO GSFC. NORMALLY GSFC VOICE CONTROL WILL OUTPUT THE TWO-WAY STATION'S BIOMED TO MCC. IF THE TWO-WAY STATION'S DATA IS LOST OR IF DIRECTED BY TIC, GSFC VOICE CONTROL WILL REMOTE THE BACKUP STATION'S BIOMED DATA TO MCC. REMOTING PROCEDURES ARE GIVEN IN THE FOLLOWING SUB-PARAGRAPHS.

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NOTE: HIGH SPEED TRACKING DATA MAY BE REQUIRED ON SHORT NOTICE AT ANYTIME DURING THE LUNAR SURFACE STAY PERIOD TO SUPPORT A CONTINGENCY LIFTOFF.

40.2.9 USB BATTLE SHORT ENABLE/DISABLE (85' & ACN ONLY) PDC# 17.

- PDC# 3
- A. THE USB BATTLE SHORT FUNCTION WILL BE ENABLED AND DISABLED ON DIRECTION FROM NETWORK DURING CRITICAL PHASES OF LM OPERATIONS. NETWORK WILL ADVISE THE STATION M&O TO ENABLE OR DISABLE THE BATTLE SHORT BY VOICE. THE STATION M&O WILL RESPOND BY VOICE WITH POSITIVE CONFIRMATION THAT THE BATTLE SHORT IS ENABLED OR DISABLED.
 - B. THE MISSION PHASES THAT REQUIRE USE OF THE BATTLE SHORT FUNCTION ARE:
 - (1) LM DESCENT-POWERED DESCENT INITIATE (PDI) MINUS 22 MINUTES THROUGH APPROXIMATELY PDI PLUS 23 MINUTES.
 - (2) LM ASCENT-LM ASCENT IGNITION MINUS 15 MINUTES THROUGH LM LUNAR ORBIT INSERTION PLUS 5 MINUTES.

PDC#17 40.3.2.3 CSM/LM UNDOCKING TO CSM/LM RENDEZVOUS. ALL STATIONS WITH
VIEW PERIODS DURING THIS PHASE CONFIGURE NET 3 FOR BIOMED AND
NET 5 FOR H.S. NETRIC DATA.

40.3.2.1 TLI to TLI +3 Hours. From TLI to TLI +3 hours, Net 3 will be used for biomed data. The M&O will ensure that biomed is patched correctly (to Net 3) and, at 2 minutes before the carriers up-time, will activate the voice/data circuit (or ensure that this is done by the GCC). At the carriers down-time after a handover, the M&O will leave the biomed data on Net 3 until instructed by TIC to terminate the transmission.

40.3.2.2 After TLI +3 Hours. After TLI +3 hours, except when high-speed metric data is required, Net 5 will be used for biomed data. The M&O will ensure that the voice/data relay is patched into Net 5 and that biomed is patched into Net 5 (paragraph 3.4.2 of the NOD). The timelines for remoting are as given previously in paragraph 40.3.2.1.

40.4 RSDP PROCEDURES

40.4.1 S-IVB/IU REDUNDANT PARAMETER SOURCE CHANGES (COS ROUTINE)

40.4.1.1 The IU link is the prime source for parameters which are redundant within the S-IVB and IU links. If the IU link is lost, an entry will be made into the TLM 642B computer in order to output redundant S-IVB and IU parameters from the S-IVB link in the high-speed TLM format. An entry must also be made to return to the IU link for the redundant parameters.

40.4.1.2 If the IU link is lost, the M&O will report the loss to NC. TIC will then query the station on the status of the IU downlink.

a. If the station reports no IU downlink, but has valid S-IVB data, TIC will instruct the M&O to initiate the COS-4 routine.

b. If the IU downlink is good, but there is a station ground system problem, the M&O will use any redundant systems available.

40.4.1.3 If the IU link becomes valid at some time after the COS-4 routine has been initiated, TIC will instruct the M&O to make the COS-I entry for returning to the IU (normally after the end of the pass).

40.4.2 POST-TLI ERASABLE MEMORY OCTAL DUMP (EMOD) PROCEDURES

If an EMOD occurs during the lunar phases, the station (normally a three-way station) may be instructed by TIC to discontinue real-time telemetry remoting to MCC, make an EMOD playback to MCC, and then reconfigure for real-time remoting to MCC (refer to the NOD, paragraph 40.2.2.7).

Note

The station should continue to track the S/C and provide tracking data or any other support required by the SCM and mission supplements.

40.4.3 COMMAND SAFING

40.4.3.1 Earth Orbital Phase. Before TLI, stations will safe the command system in accordance with Section 40 of the NOD.

40.4.3.2 Post-TLI

- a. Stations which are not requested to bring up their command carriers will place the command system to SAFE.
- b. Stations which are requested to bring up command carriers will place the command system to OPERATE 5 minutes before the carrier on-time.
- c. Five minutes after the USB carriers down-time, the M&O will ensure that the command system is safed.
- d. The M&O will place the command system to OPERATE as soon as the RTC notifies him of a contingency handover (which includes the command subcarrier) to his station.

40.4.4 DESTINATION CODES/HIGH-SPEED TLM ON-OFF

40.4.4.1 Prelaunch

- a. During the SRT, all telemetry data will be terminated on station. Upon completion of the SRT, stations will type in LOS T/ROS T and then configure high-speed lines to support the mission.
- b. TIC will command telemetry "on" (both) for support of TLM CADFISS and DGEN testing.
- c. Upon completion of GSFC TLM CADFISS/MCC DGEN interface testing, if MCC command I/F testing is to be run, the M&O will CAM 888 (GSFC off). Upon completion of all station interface testing the NC will advise the stations of the "go" status. At this time, the station will type in LOS T/ROS T to ensure that the telemetry program buffers are clear prior to AOS.
UPON COMPLETION OF PRELAUNCH COMMAND LOADING IN TERMINAL COUNT - only
- d. At T -20 minutes at launch stations, TIC will command telemetry "on" (both). Upon receipt of this MCC execute, the M&O will CAM 888 (GSFC off).

40.4.4.2 Plus Time

- a. During the SRT, all telemetry data will be terminated on station. Upon completion of the SRT, stations will type in LOS T/ROS T and configure high-speed lines to support MCC command interface testing.
- b. On cue from CADFISS, telemetry will be started by the M&O CAM 222 (GSFC only). Once the TLM CADFISS conductor gives a "go", the station will type in LOS T/ROS T to ensure that the telemetry buffers are clear prior to AOS.
- c. At approximately H-10 minutes, TIC will command telemetry "on" (both). Upon receipt of this MCC execute, the M&O will CAM 888 (GSFC off).

Note

Prior to typing in LOS T/ROS T in any of the above steps, all PCM data will be inhibited to the telemetry program.

- d. At approximately LOS +3 minutes, TIC will command telemetry "off". If TIC neglects to turn TLM off by LOS +5, the M&O will CAM TLM "off" (CAM 999).

40.4.5 MIL RECORDING OF KEY ABORT ADVISORY SYSTEM EVENTS

AIU recording times are required from T -45 minutes to T plus 3 minutes.

40.4.6 COMMAND COMPUTER VERIFICATION

STATIONS SUPPORTING WITH A SINGLE USB CARRIER WILL USE THE COMMAND COMPUTER VERIFICATION PROCEDURE. APPROXIMATELY 30 MINUTES PRIOR TO STATION SUPPORT TIME OR LUNAR EMERGENCE, THE M&O WILL VERIFY THAT THE COMMAND COMPUTER IS CONFIGURED TO SUPPORT THE ASSIGNED VEHICLE. IF REQUIRED, UPLINK EITHER OF THE FOLLOWING RTC'S TO ESTABLISH A VALID GROUND LOOP:

- A. FOR CSM SUPPORT, UPLINK CSM RTC 602 (UDL TEST A).
 - B. FOR LM/S-IV B SUPPORT, UPLINK LM RTC 514 (DCA SF TST).
- THE RTC'S WILL BE EXECUTED WITH THE COMMAND SYSTEM IN THE SAFE CONDITION AND COMMAND SUB-CARRIER DOWN. UPON COMPLETION OF THE EXECUTES AN EOF WILL BE WRITTEN.

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40.5 SPACECRAFT COMMUNICATIONS

40.5.1 GENERAL PROCEDURES

40.5.1.1 For all phases in which only the CSM is manned, the AS-506 spacecraft call sign will be Apollo 11. When both vehicles are manned, the call signs will be "COLUMBIA" for the CSM and "EAGLE" for the LM. During lunar surface operations, the call signs will be NEIL for the CMD & BUZZ for the LMP.

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40.5.1.2 All stations with VHF or USB A/G equipment will be prepared to configure in one or more of the A/G modes, in accordance with the SCM or by direction of the MCC ComTech.

40.5.1.3 Because of the use of multiple vehicles in lunar missions, new concepts of A/G voice communications, determined by the mission phase, will be encountered. Different procedures will be required for the prelaunch, launch, earth orbital, post-TLI, translunar coast, lunar orbital, transearth coast, and reentry phases. However, as in the past, the station ComTech will be required to provide, within his equipment capability, the highest quality of downlink voice to MCC.

40.5.1.4 ~~Communications tests (e.g., CSM-MSFN-LM or LM-CSM-MSFN relays) will be indicated in the "note" section of the SCM.~~

40.5.1.5 During the mission phases while VHF A/G equipment is not required (approximately TLI plus 2 hours until approximately entry interface minus 4.5 hours). USB downlink voice will be inhibited at all times when the two-way station loses downlink lock.

SPECIAL A/G CONFIGURATIONS (MSFN RELAY, ETC.) WILL BE INDICATED IN THE "NOTE" SECTION OF THE SCM. ACTUAL IMPLEMENTATION OF A SPECIAL A/G CONFIGURATION WILL BE DIRECTED VERBALLY BY THE MCC COMM TECH AT THE REQUIRED TIME.

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40.5.1.6 VOCAA OPERATING PROCEDURES.

- A. UNLESS OTHERWISE DIRECTED BY MCC, ALL STATIONS WILL OPERATE THE A/G SYSTEM WITH THE VOCAA'S BY-PASSED. THIS CONFIGURATION WILL APPLY FOR ALL MISSION PHASES EXCEPT THE FOLLOWING:

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40.5.2 PRELAUNCH PROCEDURES

40.5.2.1 General

Prelaunch voice communications with the S/C will be limited to the MCC, Launch Operations Manager (LOM), CSM Spacecraft Test Conductor (MSTC), and the Astro Communicator Panel Operator (CSTO). MIL will transfer VHF A/G receive to A/G-1 and USB A/G receive to GOSS conference. MIL will also enable simultaneous VHF and USB A/G uplinking to GOSS conference and, at T-4 minutes, will provide MCC with the receive portion of the astro-launch circuit on the A/G-1 longline.

40.5.2.2 Prelaunch/Launch Air/Ground Configuration for MIL

- a. MIL will initiate constant keying to support KSC requirements per the CSM Test and Checkout Procedure (TCP). Power output is to be limited to 100 watts nominal.
- b. During the terminal count, MIL will also inhibit the uplink capability on GOSS conference when constant keying is called for in the CSM Test and Checkout Procedure (TCP). This action will not inhibit the monitoring of the CSM S-band downlink on GOSS conference.
- c. All A/G communications checks which do not specifically call for the use of GOSS conference will be made on A/G-1 longline.
- d. If GOSS conference communications checks are required, the inhibit function will be removed for the duration of the communications check.
- e. The inhibit function on GOSS conference and the constant keying function will be removed when the launch vehicle clears the tower, or upon the direction of the MCC ComTech.

40.5.1.6 (cont'd)

- (1) APPLIES TO MIL ONLY.
 - (2) DURING CREW SLEEP CYCLES, APPLICABLE STATIONS WILL INSERT THE VOGAA IN THE CSM A/G CIRCUIT AT THE DIRECTION OF HOUSTON COMM TECH. AT THE END OF THE SLEEP CYCLE, HOUSTON COMM TECH WILL DIRECT THE APPLICABLE STATIONS TO BYPASS THE CSM VOGAA.
 - (3) DURING DUAL VEHICLE OPERATIONS, BEGINNING WITH LM ACTIVATION AT APPROXIMATELY 94 HOURS 30 MINUTES GET, THE VOGAA WILL BE INSERTED IN THE CSM A/G CIRCUIT ONLY. HOUSTON COMM TECH WILL PROVIDE A VOICE CUE ON NET 2 FOR ALL STATIONS TO INSERT THE CSM VOGAA FOR DUAL VEHICLE OPERATIONS. AT THE COMPLETION DUAL VEHICLE OPERATIONS HOUSTON COMM TECH WILL PROVIDE ANOTHER CUE ON NET 2 DIRECTING STATIONS TO BYPASS THE VOGAA IN THE CSM A/G CIRCUIT.
- B. DURING THOSE PERIODS WHEN THE VOGAA IS NOT BYPASSED THE STATION M&O AND COMM TECH WILL INSURE THAT BOTH THE INPUT AND OUTPUT OF THE VOGAA'S ARE MONITORED. IN THE EVENT THAT VOICE IS DEGRADED AT THE OUTPUT OF THE VOGAA, BUT GOOD AT THE INPUT, THE STATION WILL ADVISE NETWORK ON NET 2. IN THE EVENT OF A TOTAL VOGAA FAILURE, THE STATION M&O WILL BYPASS THE VOGAA AND THEN ADVISE NETWORK.

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C. DURING THE SITES H-70 SUPPORT COUNT, AT H-45, THE MCC COMM TECH WILL CONDUCT AN ABBREVIATED VAL 4043 A/G TEST WITH THE SITE. AT THIS TIME, THE MCC COMM TECH WILL CONFIRM THAT THE SITE IS CONFIGURED FOR PROPER VOGAA OPERATION AS REQUIRED FOR THE SITE TO BEGIN SUPPORT OF THE CURRENT MISSION PHASE.

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None of the above inhibit functions involves the A/G-1 longline. MCC requires a constant capability to communicate with the S/C on A/G-1 longline (on VHF 296.8) up to MIL LOS.

f. The MIL A/G configuration in support of MCC prelaunch operations is as follows:

- (1) A/G-1 longline transmit VHF (296.8 MHz) and CSM S-band
- (2) GOSS conference transmit VHF (296.8 MHz) and CSM S-band (when not inhibited)
- (3) Remote CSM S-band to MCC on GOSS conference
- (4) Remote VHF (259.7 MHz) to MCC on the A/G-1 longline.

40.5.3 LAUNCH PROCEDURES

40.5.3.1 At liftoff and until LOS, MIL, GBM, BDA, ANG, VAN, CYI, and ACN will enable the best source of received A/G voice (USB or VHF) to GOSS conference. This will be accomplished regardless of the SCM configuration. (GSFC voice control will make the station voice source selection for patching to the network portion of GOSS conference.) Voice uplinking will be inhibited at these station, unless a requirement is indicated in the SCM or the MCC ComTech instructs the station to go remote.

40.5.3.2 MIL, GBM, BDA, ANG, VAN, and CYI will transmit on OPN on the launch phase A/G activities. The message will be sent postpass and will provide the A/G configuration used, remoting times (GET), quality, and general comments on the A/G from the station view point. This message is to be addressed to GCTR/NOM and HNET/NC.

40.5.3.3 The station which is instructed to go remote, by SCM or by RTC (in a contingency handover) will enable VHF and USB A/G uplink voice simultaneously.

40.5.3.4 N/A TO HSK.

40.5.3.5 After T +30 minutes all stations will follow the A/G voice procedures as instructed for the various other phases of the mission.

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40.5.4 EARTH ORBITAL PROCEDURES

40.5.4.1 The following A/G communications procedures will be used unless otherwise directed by MCC:

- a. Voice uplink via USB will be controlled by USB modes and carrier on/off times. VHF voice will be uplinked during remote/local time of SCM.
- b. When a downlink transfer to MCC is indicated in the SCM, the best source (USB/VHF) will be transferred to MCC during remote/local times in A/G section of the SCM (refer to paragraph 40.5.4.3).

Note

USB downlink will be inhibited except during the times specified in the A/G section of the SCM.

SEE NEW PAGE

Note

None of the above inhibit functions involves the A/G-1 longline. MCC requires a constant capability to communicate with the S/C on A/G-1 longline (on VHF 296.8) up to MIL LOS.

f. The MIL A/G configuration in support of MCC prelaunch operations is as follows:

- (1) A/G-1 longline transmit VHF (296.8 MHz) and CSM S-band
- (2) GOSS conference transmit VHF (296.8 MHz) and CSM S-band (when not inhibited)
- (3) Remote CSM S-band to MCC on GOSS conference
- (4) Remote VHF (259.7 MHz) to MCC on the A/G-1 longline.

40.5.3 LAUNCH PROCEDURES

40.5.3.1 At liftoff and until LOS, MIL, GBM, BDA, ANG, VAN, CYI, and ACN will enable the best source of received A/G voice (USB or VHF) to GOSS conference. This will be accomplished regardless of the SCM configuration. (GSFC voice control will make the station voice source selection for patching to the network portion of GOSS conference.) Voice uplinking will be inhibited at these station, unless a requirement is indicated in the SCM or the MCC ComTech instructs the station to go remote.

40.5.3.2 MIL, GBM, BDA, ANG, VAN, and CYI will transmit on OPN on the launch phase A/G activities. The message will be sent postpass and will provide the A/G configuration used, remoting times (GET), quality, and general comments on the A/G from the station view point. This message is to be addressed to GCTR/NOM and HNET/NC.

40.5.3.3 The station which is instructed to go remote, by SCM or by RTC (in a contingency handover) will enable VHF and USB A/G uplink voice simultaneously.

40.5.3.4 N/A TO HSV.

40.5.3.5 After T +30 minutes all stations will follow the A/G voice procedures as instructed for the various other phases of the mission.

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40.5.4 EARTH ORBITAL PROCEDURES

40.5.4.1 The following A/G communications procedures will be used unless otherwise directed by MCC:

- a. Voice uplink via USB will be controlled by USB modes and carrier on/off times. VHF voice will be uplinked during remote/local time of SCM.
- b. When a downlink transfer to MCC is indicated in the SCM, the best source (USB/VHF) will be transferred to MCC during remote/local times in A/G section of the SCM (refer to paragraph 40.5.4.3).

Note

USB downlink will be inhibited except during the times specified in the A/G section of the SCM.

SEE NEW PAGE

c. The VHF transmitting and prime receive antenna will be pointed at the vehicle listed in column one of the A/G section of the SCM. Dual VHF systems will point the second VHF antenna at the opposite vehicle.

40.5.4.2 A/G voice communication in areas overlapping 85-foot antenna coverage will be accomplished in accordance with the following procedures:

- a. GDS will enable downlink to GOSS conference by directive only. The VHF A/G coverage in this area will be provided by GYM (prime) and/or CAL (secondary).
- b. At the time of handover to MAD, CYI will inhibit the downlink only and MAD will remote USB to GOSS conference during MAD carrier on-times. CYI will continue uplinking VHF until predicted LOS+2 minutes.
- c. HSK will remote USB during carrier on-times as specified in the SCM or by the MCC ComTech.

40.5.4.3 The nominal method of enabling the received A/G voice to MCC is explained in the following paragraph. At the times specified in the SCM, or when verbally cued by the MCC ComTech, stations with USB and VHF A/G capabilities will remote USB and VHF A/G links to GOSS conference, but will inhibit the USB voice downlink (if the USB system is not locked up). When the USB downlink voice quality becomes equal to, or better than, the VHF downlink voice, the station ComTech will enable the USB downlink voice and inhibit the VHF downlink voice. Should the USB downlink voice deteriorate to a condition where it is less intelligible than the VHF downlink, the station ComTech will again inhibit the USB downlink voice and activate the VHF downlink voice until the USB downlink voice again becomes the higher quality. In all cases, the station ComTech will inform the MCC ComTech whenever a downlink voice source is changed and will report the source currently being provided. In addition to monitoring the downlink sources for quality, the station ComTech will monitor these circuits for any possible S/C crew requests for S/C configuration changes. If MCC concurs in such a request, the station ComTech will reconfigure the station A/G circuits upon direction of MCC and inform the MCC ComTech when reconfigured.

40.5.5 POST-TLI PROCEDURES

At approximately TLI +2 hours, the reliability of VHF A/G communications will deteriorate to the point of being unusable. At this time, the NC will notify the NOM who will release the VHF equipment; thereafter, only the USB voice link will be used. All USB voice remoting will be in accordance with the times specified in the SCM or at the verbal direction of the MCC ComTech.

40.5.6 TRANSLUNAR COAST PROCEDURES

A/G remoting during this phase of the mission will differ from that during earth orbit, only in that the USB voice link will be the only method of communication. The USB A/G voice circuits will be remoted in accordance with the times and configurations specified in the SCM or at the verbal direction of the MCC ComTech.

40.5.7 LUNAR ORBITAL PROCEDURES

40.5.7.1 At times during this phase of the mission, both S/C will be manned. As long as line-of-sight capabilities exist, the onboard VHF equipment will be used for inter-spacecraft communication; both S/C will also transmit voice simultaneously on the USB downlinks.

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40.5.7.1 (cont'd)

ON EACH LUNAR ORBIT, AT EXPECTED EMERGENCE MINUS 5 MINUTES, MCC COMM TECH WILL CALL UP THE PRIME AND BACK UP STATIONS TO PERFORM AN ABBREVIATED VALIDATION TEST 4043 ON NET 1. THE TEST WILL CONSIST PRIMARILY OF KEYING AND VOICE CONTINUITY CHECKS. THIS PROCEDURE WILL NOT APPLY WHEN THE LM IS LANDED AND AN 85° STATION (PRIME AND WING) IS PROVIDING COVERAGE FOR BOTH VEHICLES. IN THIS CASE NET 1 WILL ALREADY BE IN USE TO THE LANDED LM PRIOR TO CSM EMERGENCE.

Pdc#5

THE COMMISSIONER OF THE LAND OFFICE
HAS THE HONOR TO ACKNOWLEDGE THE RECEIPT
OF YOUR LETTER OF THE 10TH INSTANT
IN RELATION TO THE APPLICATION FOR
A GRANT OF LAND IN THE TOWNSHIP OF
MUSKOGEE, COUNTY OF MUSKOGEE, STATE OF
ALABAMA.

THE CSM-LM/MSFN RELAY CONFIGURATION WILL BE REQUIRED FROM APPROXIMATELY PDI PLUS 23 MINUTES UNTIL LM ASCENT IGNITION. THIS CONFIGURATION WILL NOT BE USED DURING THE LM ASCENT PHASE. STATIONS WILL RECEIVE VERBAL CUES FOR IMPLEMENTATION AND TERMINATION OF MSFN RELAY FROM MCC COMM TECH OR NETWORK.

page 3

40.5.7.2 When the S/C are beyond line-of-sight communication and the VHF equipment becomes ineffectual, the only method of communication will be the USB systems. The S/C crew will inform the CAPCOM that VHF is unusable and, upon direction of the CAPCOM, the MCC ComTech will instruct the station(s) to activate the LM-CSM (MSFN) relay circuit. All USB A/G remoting and configurations will be in accordance with the times specified in the SCM or as directed by the MCC ComTech.

Note

Any time that the CSM-LM (MSFN) relay circuit is activated, only the CSM A/G circuit will be remoted to GOSS conference. This will allow MCC to communicate to both vehicles and also allow the S/C to communicate between each other via the ground station.

40.5.7.3 When the VHF line-of-sight capability is restored, the S/C crew will inform the CAPCOM that VHF is again usable. The MCC ComTech, upon the instruction of the CAPCOM, will direct the station(s) to release the LM-CSM(MSFN) relay circuit if needed. The configuration (ref SCM) of remoted A/G circuits will be maintained until other directions are received.

40.5.8 LUNAR SURFACE OPERATIONS

~~The CSM-LM/MSFN relay configuration will be maintained throughout the lunar stay period unless directed otherwise by MCC.~~

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40.5.9 TRANSEARTH COAST PROCEDURES

40.5.9.1 General. The USB voice link will continue to be the only A/G source until approximately entry interface -4 1/2 hours at which time the NC will inform the NOM, who will inform the stations via OPN that VHF A/G equipment is again required. At this time, stations will monitor the VHF downlink and report to the MCC ComTech on Net 2 when the quality becomes usable. Voice uplinking (USB and/or VHF) will be controlled by SCM or MCC ComTech. Only the two-way station will enable downlink voice unless directed otherwise by the MCC ComTech.

CRO

40.5.9.2 ~~CSM~~ Communication Test

CRO

a. A special communications test will be conducted at ~~entry~~ as soon as possible after VHF voice is reported as usable. On cue from the MCC ComTech, the USB voice (uplink and downlink) will be inhibited. On cue from the MCC ComTech, the ~~CSM~~ ComTech will remote VHF uplink and downlink to MCC via GOSS conference.

CRO

b. Upon completion of the test and on cue from the MCC ComTech, the ~~CSM~~ ComTech will inhibit VHF uplink and downlink. A selected USB station will then be instructed to remote USB voice only (uplink and downlink) to MCC via GOSS conference.

CRO

c. This procedure (USB only uplink and downlink remote to MCC) will apply if a handover to another station is necessary. In the event of a USB A/G failure, stations will be instructed by the MCC ComTech to activate the VHF A/G (uplink and downlink remoted to MCC) capability.

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40.5.10 REENTRY PROCEDURES

Full USB and VHF communication capability will be utilized or monitored in accordance with the SCM or MCC ComTech instructions. Since the CSM VHF antennas are located on the SM, a loss of VHF capability will be experienced from CM/SM separation to main chute deployment. USB voice communication will also be lost during the reentry phase because of thermal reaction of the earth's atmosphere and the CM heat shield.

40.5.11 CONTINGENCY PROCEDURES

40.5.11.1 Differences Between S/C A/G Mode and SCM. Stations will monitor all voice downlink capabilities at all times during support. Such monitoring, when it exceeds the audio monitoring capability, may be accomplished by a visual indicator. If there is a difference between the S/C mode of A/G voice and that required by the SCM, the station ComTech will reconfigure his A/G circuits to conform with the S/C and notify the M&O. The station ComTech will report this discrepancy to the MCC ComTech on Net 2.

40.5.11.2 Loss of A/G Circuits

- a. When the A/G capability is lost, the MCC ComTech will attempt to determine the cause. If there is no response from the S/C after handover has been accomplished, as specified in the SCM (no response after two voice uplink attempts), the MCC ComTech will query the station ComTech on Net 1 concerning the quality of A/G uplink and downlink.

Note

The station should be prepared to report to the MCC ComTech the suspected condition if the CAPCOM fails to receive a response from the S/C after two attempts.

- b. If there is a loss of prime A/G mode from within the ground station or the S/C, the station ComTech will verify the quality of the alternate A/G mode and remote it to GOSS conference. He will inform the M&O and the MCC ComTech of this action.

40.5.11.3 USB Backup Voice (30-foot). Throughout all passes, the station ComTech will monitor the backup voice circuits, which will also be recorded. If any voice is received on these circuits, the ComTech will notify the M&O who will immediately inform the NC on Net 2. If the S/C attempts to establish contact by this means, the station ComTech will remote this circuit to GOSS conference and notify the MCC ComTech on Net 2. Voice playback of any contacts obtained during this period may be requested by MCC.

40.5.11.4 USB Backup Voice and AM Key (85-foot). Throughout all passes, the station SDDS operator will monitor the backup voice and AM key circuits, which will also be recorded. If contact is made on either link, the SDDS operator will inform the M&O, who will immediately notify the NC on Net 2. Any attempt by the S/C to establish contact on either link will be the cue for the M&O to remote this circuit to GOSS conference and report his actions to the MCC ComTech on Net 2. It is required that a qualified operator be in the immediate vicinity to decipher any AM key reception. MCC may request playback of any contacts monitored during this period.

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40.5.10 REENTRY PROCEDURES

Full USB and VHF communication capability will be utilized or monitored in accordance with the SCM or MCC ComTech instructions. Since the CSM VHF antennas are located on the SM, a loss of VHF capability will be experienced from CM/SM separation to main chute deployment. USB voice communication will also be lost during the reentry phase because of thermal reaction of the earth's atmosphere and the CM heat shield.

40.5.11 CONTINGENCY PROCEDURES

40.5.11.1 Differences Between S/C A/G Mode and SCM. Stations will monitor all voice downlink capabilities at all times during support. Such monitoring, when it exceeds the audio monitoring capability, may be accomplished by a visual indicator. If there is a difference between the S/C mode of A/G voice and that required by the SCM, the station ComTech will reconfigure his A/G circuits to conform with the S/C and notify the M&O. The station ComTech will report this discrepancy to the MCC ComTech on Net 2.

40.5.11.2 Loss of A/G Circuits

- a. When the A/G capability is lost, the MCC ComTech will attempt to determine the cause. If there is no response from the S/C after handover has been accomplished, as specified in the SCM (no response after two voice uplink attempts), the MCC ComTech will query the station ComTech on Net 1 concerning the quality of A/G uplink and downlink.

Note

The station should be prepared to report to the MCC ComTech the suspected condition if the CAPCOM fails to receive a response from the S/C after two attempts.

- b. If there is a loss of prime A/G mode from within the ground station or the S/C, the station ComTech will verify the quality of the alternate A/G mode and remote it to GOSS conference. He will inform the M&O and the MCC ComTech of this action.

40.5.11.3 USB Backup Voice (30-foot). ~~Throughout all phases, the station ComTech~~

151 #47
THROUGHOUT ALL SUPPORT TIMES, THE STATION WILL MONITOR THE BACKUP VOICE DOWNLINK CIRCUIT(S) WHICH WILL ALSO BE RECORDED. IF THE S/C ATTEMPTS TO ESTABLISH CONTACT BY THIS MEANS, THE FIRST STATION TO MONITOR THE DOWNLINK ATTEMPT WILL ANNOUNCE ON NET 2 "(STA) HAS (VEH) BACKUP VOICE CONTACT". ALL OTHER STATIONS EXCEPT THE DESIGNATED 2-WAY AND BACKUP STATIONS WILL REFRAIN FROM MAKING A DUPLICATE ANNOUNCEMENT. THE DESIGNATED 2-WAY STATION WILL TRANSFER THE (VEH) BACKUP VOICE TO NET 1 AND INFORM THE MCC COM TECH ON NET 2 OF HIS ACTIONS. MCC MAY REQUEST PLAYBACK OF ANY CONTACTS MONITORED DURING THIS PERIOD.

NOTE

THE BASIC PROCEDURE DESCRIBED ABOVE SHALL BE FOLLOWED FOR ANY DOWNLINK CONFIGURATION OTHER THAN THAT SPECIFIED IN THE SCM.

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THROUGHOUT ALL SUPPORT TIMES, THE SDDS OPERATOR WILL MONITOR THE BACKUP VOICE AND AM KEY DOWNLINK CIRCUITS, WHICH WILL ALSO BE RECORDED. IF THE S/C ATTEMPTS TO ESTABLISH CONTACT BY THESE CIRCUITS, THE FIRST STATION TO MONITOR THE DOWNLINK ATTEMPT WILL ANNOUNCE ON NET 2 "(STA) HAS (VEH) (BACKUP VOICE OR AM KEY) CONTACT". ALL OTHER STATIONS EXCEPT THE DESIGNATED 2-WAY AND BACKUP STATIONS WILL REFRAIN FROM MAKING A DUPLICATE ANNOUNCEMENT. THE DESIGNATED 2-WAY STATION WILL TRANSFER THE (VEH) (BACKUP VOICE OR AM KEY) TO NET 1 AND INFORM THE MCC COM TECH ON NET 2 OF HIS ACTIONS. MCC MAY REQUEST PLAYBACK OF ANY CONTACTS MONITORED DURING THIS PERIOD.

NOTE

THE BASIC PROCEDURE DESCRIBED ABOVE SHALL BE FOLLOWED FOR ANY DOWNLINK CONFIGURATION OTHER THAN THAT SPECIFIED IN THE SCM. IT IS REQUIRED THAT A QUALIFIED OPERATOR BE IN THE IMMEDIATE VICINITY OF THE SDDS TO DECIPHER ANY AM KEY RECEPTION.

40.5.11.5 Voice Handover. During any contingency handover in which the stations are remoting A/G voice, the voice will be handed over on the RTC cue for a command handover, unless otherwise directed by MCC.

Note

The only exception to this will occur during a handover from GYM to GDS. GYM will hold the VHF A/G remote until MCC RTC conducts a handover between GDS and TEX on Net 2, or until the MCC ComTech directs the station to handover to TEX.

~~40.5.11.6 Dual Voice Link. If independent voice communication to each vehicle (CSM and LM) is required, the following configuration will apply:~~

- ~~a. The CSM/USB loop will be the Net 1 (GOSS conference) circuit to the CSM.~~
 - ~~b. The LM/USB loop will be the Net 2 circuit to the LM.~~
 - ~~c. Station personnel will use Net 3 access keys to resume Net 2 voice functions and identify the loop as Net 2 in all transmissions.~~
- PDC #3.

40.5.11.7 LM Monitoring. During TLC when a station is configured via SCM to monitor the LM downlink, the station ComTech will monitor the LM downlink voice source, particularly during the time when there is no voice downlink from the CSM. Should the station receive voice from the LM, the station ComTech will immediately enable the LM downlink to GOSS conference and notify MCC ComTech on Net 2.

Note

Do not inhibit the CSM remote to GOSS conference at any time during this configuration except as directed by MCC.

40.6 SATCOM CONTINGENCY PROCEDURES (CLASS-19 SHIPS)

40.6.1 If the normal 2.4-kbps data link (SATCOM) fails, the ships have the capability to output 1.2-kbps data via HF circuits. The 1.2-kbps data will be displayed in MCC at one-half the normal rate. The switch in data rates will be accomplished in accordance with Section 51 of the NOD.

40.6.2 If the 1.2-kbps data rate becomes necessary, the M&O, after notification by the Communications manager, will ensure that the ship is configured as soon as possible, and subsequently will notify the Communications manager that configuration is complete. During the reconfiguration, the M&O will notify the NC on Net 2 when the TLM program has been recycled and verified.

40.7 SPAN SOLAR FLARE REPORTING PROCEDURES

40.7.1 After first notice of a major optical flare (corrected area greater than 15 sq degrees), or if a channel B flux which is 500 flux units greater than the preburst level, the span observer will request the M&O to contact the Space Environment Console (SEC) at MCC.

40.7.2 While configured for two-way support, the M&O will contact the NC on Net 2.

40.7.3 At all other times, the M&O will contact the NC on Net 2.

40.7.4 When instructed by the M&O, the span observer will give a verbal report to the SEC.

40.8 RADAR TRAJECTORY DATA PRIORITY PROCEDURES

40.8.1 A station having both USB and C-band tracking capability will treat the USB tracking data as prime. Where line limitations exist, C-band tracking data will be sent postpass, unless otherwise specified in the SCM.

40.8.2 Low-speed data at BDA will have the following priorities:

- a. USB
- b. FPQ-6
- c. FPS-16.

40.9 SPECIAL COMMAND PROCEDURE

During TLC and TEC crew sleep periods, CSM omni-antenna selection will be commanded by MCC. This type of operation will require a real-time change in uplink mode as soon as possible if command capability is lost (due to uplink circuit margin) prior to the required omni-selection. In order to improve the circuit margin to enable a successful omni-switch in the least amount of time, MCC will request the station M&O to reconfigure, for uplink, Mode 3, on Net 2. Upon termination of the special situation, Track will notify the M&O to reconfigure to the original uplink mode.

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PDC #17 | 40.7.3 At all other times, the M&O will contact the NC on Net 2. (OUT OF CONFERENCE)

40.7.4 When instructed by the M&O, the span observer will give a verbal report to the SEC.

40.8 RADAR TRAJECTORY DATA PRIORITY PROCEDURES

40.8.1 A station having both USB and C-band tracking capability will treat the USB tracking data as prime. Where line limitations exist, C-band tracking data will be sent postpass, unless otherwise specified in the SCM.

40.8.2 Low-speed data at BDA will have the following priorities:

- a. USB
- b. FPQ-6
- c. FPS-16.

40.9 SPECIAL COMMAND PROCEDURE

During TLC and TEC crew sleep periods, CSM omni-antenna selection will be commanded by MCC. This type of operation will require a real-time change in uplink mode as soon as possible if command capability is lost (due to uplink circuit margin) prior to the required omni-selection. In order to improve the circuit margin to enable a successful omni-switch in the least amount of time, MCC will request the station M&O to reconfigure, for uplink, Mode 3, on Net 2. Upon termination of the special situation, Track will notify the M&O to reconfigure to the original uplink mode.

PDC #3 | ALSO, DURING TLC AND TEC, CSM PM DOWNLINK MODES MAY BE CHANGED FROM 08 TO 16 WHEN ADDITIONAL TELEMETRY DATA IS REQUIRED FOR ANALYSIS. TRACK WILL NOTIFY THE AFFECTED STATIONS OF THESE CHANGES AS REQUIRED.

ISI #34 | 40.10 SPECIAL TLM PROCEDURE (GDS/MARS - DSS 14) - N/A TO HSK

PART IV
INSTRUMENTATION PROCEDURES

NOTE

Sections 59 and 60 require no supplementary information for the AS-506 mission (See the NOD).

Supplement to Section 50

Computer Support

SUPPLEMENT TO SECTION 50. COMPUTER SUPPORT

50.1 GSFC REAL-TIME SYSTEM (GRTS)

50.1.1 POINTING DATA

50.1.1.1 Nominal. Before F-7 days, supporting stations will receive nominal pointing data for the launch phase and first revolution at the various possible launch azimuths, beginning with 72 degrees. Data will be in 3-degree increments. Tapes, labeled to indicate the launch azimuth, will be transmitted as specified in column 1 of table 50-1.

50.1.1.2 Contingency. If contingent pointing data is required, further information and instructions will be provided by PDC or ISI.

50.1.2 ACQUISITION MESSAGES

50.1.2.1 No Burn TLI Acquisition Messages. Before the first TLI opportunity, GRTS, will generate and transmit "no burn" CSM acquisition messages as specified in column 2 of table 50-1. These messages, which will reflect a continuation of the earth-orbital phase without any injection burn, will be sent to those stations scheduled to view the burn and those having AOS within 30 minutes if the burn should not occur. If the first opportunity is cancelled or missed and injection is scheduled for the second opportunity, these procedures will be repeated.

50.1.2.2 Post-TLI S-IVB Acquisition Messages. For the life of the S-IVB communications system (approximately 12 hours), GRTS will transmit post-TLI acquisition messages to those stations which are scheduled to track the S-IVB after separation (see column 1 of table 50-1).

50.1.2.3 Lunar Tracking Acquisition Messages. By F-7 days, GSFC will generate lunar track acquisition messages and transmit them only to GDS, GDSX, HSK, HSKX, MAD, and MADX as directed in paragraph 40.2.3.2 of this supplement.

50.1.3 REAL-TIME SYSTEM

During the launch phase, GRTS will accept data from the Real-time Computing System (RTCS) Impact Predictor (IP) computer via the Launch Trajectory Data System (LTDS) and the Apollo Launch Data System (ALDS). GRTS will also accept C-band and USB metric tracking data from the supporting network during the earth-orbital and reentry phases. GSFC will use this information to drive various displays in the MSFNOC.

50.1.4 CADFISS

50.1.4.1 General. CADFISS testing within the participating network will be conducted, using GSFC computers, as established in the NCG schedule and as detailed in CADFISS briefing messages which will precede scheduled tests. Exercises will generally include boresight and clockwise slew tests with the C-band radars; and boresight, range, antenna position programmer, TLM, and CMD tests with the USB stations. High-speed interface tests will be conducted with ALDS and LTDS. Post-launch CADFISS times will be issued in the site release messages. No CMD CADFISS tests will be conducted during the final phases of the terminal count or after launch. Scripts for the CMD, and tracking CADFISS tests and appropriate comments are given in paragraphs 50.1.4.2 through 50.1.4.4.

Table 50-1. GRTS Acquisition Message and Pointing Data Plan

Mission Phases Type of Station	Column 1	Column 2	Column 3
	Nominal (provided at approx F-7 day for the first rev in launch azimuth increments of 3°)	No burn TLI (provided in the event TLI does not occur as planned)	Post TLI (provided after TLI for the S-IVB until battery depletion) (Note 5)
30' USB Stations (Land)	29-point acquisition messages (Note 1)	29-point and 6-point acquisition messages	29- and 6-point acquisition messages (Note 5)
85' USB Station	29-point acquisition message (Note 1)	29-point acquisition message	29-point acquisition messages (Note 5)
C-band stations (Land)	20-second pointing data (Notes 1 and 2)	6-Point: ALL IRV: All except TAN, BDA (FPS-16) HAW	6-Point: ALL IRVs: All except TAN, HAW, and BDA (FPS-16) (Note 5)
Ships			
Insertion	IRVs, 20-second pointing data and 29-point acquisition message (Note 3)	IRVs	IRVs (Note 5)
Injection	IRVs and 29-point acquisition message (Note 4)	IRVs	IRVs (Note 5)

Notes

1. An acquisition message for a given launch azimuth will remain valid for each day of the launch window.
2. For the launch phase, C-band radar pointing data will be generated by the ETR technical laboratory.
3. The insertion ship will be provided two IRVs for each launch azimuth increment: one for AOS and one for insertion.
4. Separate IRVs and 29-point acquisition messages will be provided for each different TSP of the launch window.
5. Provided only to stations scheduled to track.

50.1.4.2 Command CADFISS Scriptsa. General

Initial conditions for these test areas follow:

- (1) Mode 2
- (2) Mission ID, bit 0
- (3) Load enable
- (4) An invalid ground loop, established by switching the 1299 switchboard to the neutral position from the computer output channel.
- (5) In the MAP mode, the MAP inputs will come from the CADFISS TLM test tapes.
- (6) In the no MAP mode, the MAPs will be inhibited at the external interrupt inhibit switch on the command computer for each vehicle.
- (7) USB transmitters on.
- (8) R-F power on.

Note

The command Apollo maximal testing configuration, i.e., uplinking via USB with or without MAP returns with a remoted site, is contained in the following sequence of events.

b. Associated Test Mnemonics

- (1) CMDL/INSS-U/CDP: TTY loads for input subsystem test.
- (2) CMDH/INSS-U/CDP: High-speed input subsystem test.
- (3) RPTL/INSS-U/CDP: Input subsystem TTY VAL tape test.
- (4) CMDH/INUP-U/USB*: High-speed input uplink test.
- (5) RPTL/INUP-U/CDP: Input uplink TTY VAL tape test.
- (6) CMDH/ISSA-U/CDP: High-speed abbreviated data flow input subsystem test.
- (7) RPTL/ISSA-U/CDP: Abbreviated input subsystem TTY VAL tape test.

c. Combined CSM/LM and SLV Vehicle Test (with uplinking)

- (1) Low-speed Output Test - CMDL/INSS-U/CDP

Loads 0002, 2002, 4002.

*Represents an M or an N for the MAP or no MAP uplink test.

(2) High-speed Test - CMDH/INUP-U/USB*

- (a) Loads 0001, 0601, 0701, 0801 0801, 0901, 1001, 1201.
- (b) Test case 0302, illegal subblock count. HSD ERR 13.
- (c) Loads 1301, 1401, 1801, 1901.
- (d) Test case 0702, incorrect data word count. HSD ERR 15.
- (e) Loads 2001, 2101, 2201, 2301, 2401, 2501, 2601, 2801, 3801, 3901.
- (f) Time delay, 0.5 minutes.
- (g) Loads 4001, 4101, 4201, 4301.
- (h) Test case 4302, subblock count out of sequence. HSD ERR 14.
- (i) Loads 4401, 4501, 4601.
- (j) Test case 4602, error code perturbation. HSD ERR 02.
- (k) Loads 4701, 4801, 4901.
- (l) Test case 4802, illegal vehicle ID. HSD ERR 09.
- (m) Loads 5001, 5101, 5201.
- (n) Test case 4001, same type and message number. HSD ERR 19.
- (o) Loads 5301, 5701, 5801, 5901
- (p) IC message, switch to load disable.
- (q) Time delay, 2 minutes.
- (r) Load 0802 into TMP storage.
- (s) Load inventory summary request No. 1.
- (t) Time delay, 1.5 minutes.
- (u) Test case 0902. TMP NONVAL expected with TMP storage full. HSD ERR 20.
- (v) Uplink loads 0701, 0801, 1001, 2101, 4201, 4301 for expected return of ground rejects.
- (w) TMP LD CLR 0802.
- (x) IC message, establish a valid ground loop at the 1299 switchboard, read TTY tape into CDP, load 0002 first, then 2002 and 4002, switch from load disable to load enable for each load, end sequence in the load enable position.

*Represents an M or an N for the MAP or no MAP test.

- (y) Time delay, up to 4 minutes for validations of TTY load 0002.
- (z) Time delay, up to ² minutes for validations of TTY load 2002.
- (aa) Time delay, up to ² minutes for validations of TTY load 4002.
- (ab) Uplink load 0701 and RTCs 604, 605, 607.
- (ac) Command history request, CSM type No. 1.
- (ad) Time delay, 1.5 minutes.
- ~~(ae) Uplink load 4001 and RTC 040.~~
- (af) Command history request, CSM type No. 2.
- (ag) Time delay, 1.5 minutes.
- (ah) Uplink CSM RTCs 606, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641.
- (ai) IC message, single frequency stations switch for SLV-LM uplinks.
- (aj) Time delay, 1.5 minutes.
- (ak) Uplink load 4001, RTC 040 and load 2001.
- (al) Command history request, SLV type No. 1.
- (am) Time delay, 1.5 minutes.
- (an) Command history request, LM type No. 1.
- (ao) Time delay, 1.5 minutes.
- (ap) Computer status request, USB.
- (aq) Command history request, LM type No. 2
- (ar) Time delay, 1.5 minutes.
- (as) Uplink SLV RTCs 002, 004, 006, 010, 012, 022, 036, 042, 046, 050, 052, 054, 056, 060, 066, 070, 072, 074, 076, 100, 102, 112, 114, 116, 120, 122, 126, 130, 132, 134, 136, 140, 241, 242, 244, 245, 246, 247, 248, 260, 261, 262, 301, 302, 303, 304, 305, 306, 307, 308, 309, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782.
- (as) Perm Load Clear 0901, 2201, 4201, 4301
- (at) Load inventory summary request No. 2.
- (au) IC message, perform command load recovery testing.

PDC #13.

1. The first part of the document is a list of names and addresses of the members of the committee.

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- (y) Time delay, up to 4 minutes for validations of TTY load 0002.
- (z) Time delay, up to 4 minutes for validations of TTY load 2002.
- (aa) Time delay, up to 4 minutes for validations of TTY load 4002.
- (ab) Uplink load 0701 and RTCs 604, 605, 607.
- (ac) Command history request, CSM type No. 1.
- (ad) Time delay, 1.5 minutes.
- (ae) Uplink load 4001 and RTC 040.
- (af) Command history request, CSM type No. 2.
- (ag) Time delay, 1.5 minutes.
- (ah) Uplink CSM RTCs 606, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641.
- (ai) IC message, single frequency stations switch for SLV-LM uplinks.
- (aj) Time delay, 1.5 minutes.
- (ak) Uplink load 4001, RTC 040 and load 2001.
- (al) Command history request, SLV type No. 1.
- (am) Time delay, 1.5 minutes.
- (an) Command history request, LM type No. 1.
- (ao) Time delay, 1.5 minutes.
- (ap) Computer status request, USB.
- (aq) Command history request, LM type No. 2
- (ar) Time delay, 1.5 minutes.
- (as) Uplink SLV RTCs 002, 004, 006, 010, 012, 022, 036, 042, 046, 050, 052, 054, 056, 060, 066, 070, 072, 074, 076, 100, 102, 112, 114, 116, 120, 122, 126, 130, 132, 134, 136, 140, 241, 242, 244, 245, 246, 247, 248, 260, 261, 262, 301, 302, 303, 304, 305, 306, 307, 308, 309, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782.
- (at) Load inventory summary request No. 2.
- (au) IC message, perform command load recovery testing.

SFB

NEW

PAGE.

(3) Low-speed Input Test - RPTL/INUP-U/CDP

(a) Load inventory summary containing 0001, 0601, 0701, 0801, 0901, 1001, 1201, 1301, 1401, 1801, 1901, 2001, 2101, 2201, 2301, 2401, 2501, 2601, 2801, 3801, 3901, 4001, 4101, 4201, 4301, 4401, 4501, 4601, 4701, 4801, 4901, 5001, 5101, 5201, 5301, 5701, 5801, 5901, and TMP 0802.

(b) Command history CSM type No. 1 and No. 2.

(c) Command history SLV type No. 1.

(d) Command history LM type No. 1 and No. 2.

(e) Load inventory summary containing loads 0001, 0002, 0601, 0701, 0801, 1001, 1201, 1301, 1401, 1801, 1901, 2001, 2002, 2101, 2301, 2401, 2601, 2801, 3801, 3901, 4001, 4002, 4101, 4401, 4501, 4601, 4701, 4801, 4901, 5001, 5101, 5201, 5301, 5701, 5801, 5901.

(f) Load inventory summary after clearing and before command recovery, containing no loads.

(g) Load inventory summary after command recovery containing the same loads that appear in 50.1.4.2.c (3) (e).

d. Combined CSM/LM and SLV Vehicle Test (No Uplinking)(1) Low-speed Output Test - CMDL/INSS-U/CDP

Loads 0007, 2002, 4002.

(2) High-speed Test - CMDH/INSS-U/CDP (No Uplinking)

(a) Loads 0001, 0601, 0701, 0801, 0901, 1001, 1201.

(b) Test case 0302, illegal subblock count. HSD ERR 13.

(c) Loads 1301, 1401, 1801, 1901.

(d) Test case 0702, incorrect data word count. HSD ERR 15.

(e) Loads 2001, 2101, 2201, 2301, 2401, 2501, 2601, 2801, 3801, 3901.

(f) Time delay, 0.5 minutes.

(g) Loads 4001, 4101, 4201, 4301.

(h) Test case 4302, subblock count out of sequence. HSD ERR 14.

(i) Loads 4401, 4501, 4601.

(j) Test case 4602, error code perturbation. HSD ERR 02.

(k) Loads 4701, 4801, 4901.

- (l) Test case 4802, illegal vehicle ID. HSD ERR 09.
 - (m) Loads 5001, 5101, 5201.
 - (n) Test case 4001, same type and message number. HSD ERR 19.
 - (o) Loads 5301, 5701, 5801, 5901.
 - (p) IC message switch to load enable.
 - (q) Time delay, 2 minutes.
 - (r) Load 0802 into TMP storage.
 - (s) Load inventory summary request No. 1.
 - (t) Time delay, 1.5 minutes.
 - (u) Test case 0902, TMP NONVAL expected with TMP storage full. HSD ERR 20.
 - (v) TMP LD CLR 0802.
 - (w) IC message, establish a valid ground loop at the 1299 switchboard, read TTY tape into CDP, load 0002 first, then 2002 and 4002, switch from load disable to load enable for each load, end sequence in the load enable position.
 - (x) Time delay, up to 4 minutes for validations of TTY load 0002.
 - (y) Time delay, up to 2 minutes for validations of TTY load 2002.
 - (z) Time delay, up to 2 minutes for validations of TTY load 4002.
 - (aa) IC message, single frequency stations switch for SLV-LM uplinks.
 - (ab) Time delay, 1.5 minutes.
 - (ac) Computer status request, USB.
 - ~~(ad) Time delay, 1.5 minutes.~~
 - (ae) PRM LD CLR 0901, 2201, 4201, 4301.
 - (af) Load inventory request No. 2.
 - (ag) IC message, perform command recovery testing.
- (3) Low-speed Input Test - RPTL/INSS-U/CDP
- (a) Load inventory summary containing 0001, 0601, 0701, 0801, 0901, 1001, 1201, 1301, 1401, 1801, 1901, 2001, 2101, 2201, 2301, 2401, 2501, 2601, 2801, 3801, 3901, 4001, 4101, 4201, 4301, 4401, 4501, 4601, 4701, 4801, 4901, 5001, 5101, 5201, 5301, 5701, 5801, 5901, and TMP 0802.

Doc #13

TO: DIRECTOR, FBI (100-374301)

FROM: SAC, NEW YORK (100-100000)

SUBJECT: JAMES EARL RAY; AKA; REFUGEE; ET AL.

RE: NEW YORK TELETYPE TO BUREAU, 10/10/68.

FOR INFORMATION OF THE BUREAU, THE FOLLOWING IS A SUMMARY OF THE INFORMATION RECEIVED FROM THE NEW YORK OFFICE:

1. JAMES EARL RAY, AKA, REFUGEE, ET AL.

2. RAY IS CURRENTLY IN THE UNITED STATES.

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20. RAY IS CURRENTLY IN THE UNITED STATES.

1. The first part of the document is a list of the names of the persons who were present at the meeting. The names are listed in alphabetical order.

2. The second part of the document is a list of the topics that were discussed at the meeting. The topics are listed in alphabetical order.

3. The third part of the document is a list of the actions that were taken at the meeting. The actions are listed in alphabetical order.

4. The fourth part of the document is a list of the dates when the actions were completed. The dates are listed in alphabetical order.

5. The fifth part of the document is a list of the persons who were responsible for the actions. The persons are listed in alphabetical order.

6. The sixth part of the document is a list of the persons who were responsible for the actions. The persons are listed in alphabetical order.

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19. The nineteenth part of the document is a list of the persons who were responsible for the actions. The persons are listed in alphabetical order.

20. The twentieth part of the document is a list of the persons who were responsible for the actions. The persons are listed in alphabetical order.

(b) Load inventory summary containing loads 0001, 0002, 0601, 0701, 0801, 1001, 1201, 1301, 1401, 1801, 1901, 2001, 2002, 2102, 2301, 2401, 2501, 2601, 2801, 3801, 3901, 4001, 4002, 4101, 4401, 4501, 4601, 4701, 4801, 4901, 5001, 5101, 5201, 5301, 5701, 5801, 5901.

(c) Load inventory summary after clearing and before command recovery containing no loads.

(d) Load inventory summary after command recovery containing the same loads that appear in 50.1.4.2d (2) (b).

e. Combined CSM/LM and SLV Abbreviated Testing (Used in Count Testing).

(1) Low-speed Output - CMDL/INSS-U/CDP

Loads 0002, 2002, 4002.

(2) High-speed Test - CMDH/ISSA-U/CDP

(a) Loads 1201, 2201, 4201.

(b) IC message, establish a valid ground loop at the 1299 switchboard, read TTY tape into CDP, load 0002 first, then 2002 and 4002, switch from load disable to load enable for each load, end sequence in the load enable position.

(c) Time delay, up to 4 minutes for validations of TTY load 0002.

(d) Time delay, up to 2 minutes for validations of TTY load 2002.

(e) Time delay, up to 2 minutes for validations of TTY load 4002.

(f) Load inventory summary request No. 1.

(g) Time delay, 1.5 minutes.

(h) Test case, command terminate. HSD ERR 07.

(i) LD CLR 1201, 2201, 4201, 0002, 2002, 4002.

(j) Inventory summary request No. 2.

(3) Low-speed Input (Voiced) RPTL/ISSA-U/CDP

(a) Load inventory summary containing 0002, 1201, 2002, 2201, 4002, 4201.

(b) Load inventory summary after clearing containing no loads.

~~f. CSM and SLV Vehicle Only (with uplinking)~~

~~(1) Low-speed Output Test - CMDL/INSS-U/CDP~~

~~Loads 0002, 4002.~~

~~(2) High-speed Test - CMDH/INUP-U*~~

- (a) Loads 0001, 0601, 0701, 0801, 0901, 1001, 1201.
- (b) Test case 0302, illegal subblock count. HSD ERR 13.
- (c) Loads 1301, 1401, 1801, 1901.
- (d) Test case 0702, incorrect data word count. HSD ERR 15.
- (e) Loads 4001, 4101, 4201, 4301.
- (f) Test case 4302, subblock count out of sequence. HSD ERR 14.
- (g) Loads 4401, 4501, 4601.
- (h) Test case 4602, error code perturbation. HSD ERR 02.
- (i) Loads 4701, 4801, 4901.
- (j) Test case 4802, illegal vehicle ID. HSD ERR 09.
- (k) Loads 5001, 5101, 5201.
- (l) Test case 4001, same type and message number. HSD ERR 19.
- (m) Loads 5301, 5701, 5801, 5901.
- (n) IC message, switch to load disable.
- (o) Time delay, 1.5 minutes.
- (p) Load 0802 into TMP storage.
- (q) Load inventory summary request No. 1.
- (r) Time delay, 1.5 minutes.
- (s) Test case 0902, TMP NONVAL expected with TMP storage full. HSD ERR 20.
- (t) Uplink loads 0701, 0801, 1001, 4201, 4301, 4401 for expected return of ground rejects.
- (u) TMP LD CLR 0802.
- (v) IC message, establish a valid ground loop at the 1299 switchboard, read TTY tape into CDP, load 0002 first, switch from load disable to load enable for each load, end sequence in the load enable position.
- (w) Time delay, up to 4 minutes for validations of TTY load 0002.
- (x) Time delay, up to 4 minutes for validations of TTY load 4002.

PDC
#13

~~*Represents an M or an N for MAP or no MAP uplink test~~

- (y) Uplink load 0701 and RTCs 604, 605, 607.
- (z) Command history request, CSM type No. 1.
- (aa) Time delay, 1.5 minutes.
- (ab) Uplink load 4001 and RTC 040.
- (ac) Command history request, CSM type No. 2.
- (ad) Time delay, 1.5 minutes.
- (ae) Command history request, SLV type No. 1.
- (af) Time delay, 1.5 minutes.
- (ag) Uplink RTCs 606, 608, 609, 610, 611, 612, 613, 614, 615, 616.
- (ah) Computer status request, USB.

(ai) Uplink RTCs 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 002, 004, 006, 010, 012, 022, 036, 042, 050, 052, 054, 056, 060, 066, 070, 072, 074, 076, 100, 102, 112, 114, 116, 120, 122, 126, 130, 132, 134, 136, 140, 241, 242, 244, 245, 246, 247, 248, 260, 261, 262, 301, 302, 303, 304, 305, 306, 307, 308, 309, 381, 382, 383, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782.

- (aj) Uplink loads 0801, 0901.
- (ak) PRM LD CLR 0901, 1001, 1201, 4201, 4301.
- (al) Load inventory summary request No. 2.
- (am) IC message, perform command load recovery testing.

(3) Low-speed Input Test - RPTL/INUP-U/CDP

- (a) Load inventory summary containing loads 0001, 0601, 0701, 0801, 0901, 1001, 1201, 1301, 1401, 1801, 1901, 4001, 4101, 4201, 4301, 4401, 4501, 4601, 4701, 4801, 4901, 5001, 5101, 5201, 5301, 5701, 5801, 5901, and TMP 0802.
- (b) Command history CSM type No. 1 and No. 2.
- (c) Command history SLV type No. 1.
- (d) Load inventory summary containing loads 0001, 0002, 0601, 0701, 0801, 1301, 1401, 1801, 1901, 4001, 4002, 4101, 4401, 4501, 4601, 4701, 4801, 4901, 5001, 5101, 5201, 5301, 5701, 5801, 5901.

(e) Load inventory summary after clearing and before command recovery containing no loads.

(f) Load inventory summary after command recovery containing the same loads that appear in 50.1.4.2p (3) (d).

g. CSM and SLV Vehicle Only (No Uplinking)

(1) Low-speed Output Test - CMDL/INSS-U/CDP

Loads 0002, 4002.

(2) High-speed Test - CMDH/INSS-U/CDP (No Uplinking)

(a) Loads 0001, 0601, 0701, 0801, 0901, 1001, 1201.

(b) Test case 0302, illegal subblock count. HSD ERR 13.

(c) Loads 1301, 1401, 1801, 1901.

(d) Test case 0702, incorrect data word count. HSD ERR 15.

(e) Loads 4001, 4101, 4201, 4301.

(f) Test case 4302, subblock count out of sequence. HSD ERR 14.

(g) Loads 4401, 4501, 4601.

(h) Test case 4602, error code perturbation. HSD ERR 02.

(i) Loads 4701, 4801, 4901.

(j) Test case 4802, illegal vehicle ID. HSD ERR 09.

(k) Loads 5001, 5101, 5201.

(l) Test case 4001, same type and message number. HSD ERR 19.

(m) Loads 5301, 5701, 5801, 5901.

(n) IC message, switch to load disable.

(o) Time delay, 1.5 minutes.

(p) Load 0802 into TMP storage.

(q) Load inventory summary request No. 1.

(r) Time delay, 1.5 minutes.

(s) Test case 0902, TMP NONVAL expected with TMP storage full. HSD ERR 20.

(t) TMP LD CLR 0802.

PDC
#13.

(u) IC message, establish a valid ground loop at the 1299 switchboard, read TTY tape into CDP, load 0002 first, switch from load disable to load enable for each load, end sequence in the load enable position.

(v) Time delay, up to 4 minutes for validations of TTY load 0002.

(w) Time delay, up to 4 minutes for validations of TTY load 4002.

(x) Time delay, 4.5 minutes.

(y) Computer status request, USB.

(z) PRM LD CLR 0901, 1001, 1201, 4201, 4301.

(aa) Load inventory summary request No. 2.

(ab) IC message, perform command load recovery testing.

(3) Low-speed Input Test - RPTL/INSS-U/CDP

(a) Load inventory summary containing load 0001, 0601, 0701, 0801, 0901, 1001, 1201, 1301, 1401, 1801, 1901, 4001, 4101, 4201, 4301, 4401, 4501, 4601, 4701, 4801, 4901, 5001, 5101, 5201, 5301, 5701, 5801, 5901, and TMP 0802.

(b) Load inventory summary containing loads 0001, 0002, 0701, 0801, 1301, 1401, 1801, 1901, 4001, 4002, 4101, 4401, 4501, 4601, 4701, 4801, 4901, 5001, 5101, 5201, 5301, 5701, 5801, 5901.

(c) Load inventory summary after clearing and before command recovery containing no loads.

(d) Load inventory summary after command recovery containing the same loads that appear in 50.1.4.2.q (3) (b).

h. CSM and SLV Abbreviated Testing (Used in Count Testing)

(1) Low-speed Output Test - CMNDL/INSS-U/CDP

Loads 0002, 4002.

(2) High-speed Test - CMDH/ISSA-U/CDP

(a) Loads 1201, 4201.

(b) IC message, read TTY tape into CDP, load 0002 first switch from load disable to load enable for each load, end sequence in the load enable position.

(c) Time delay, up to 4 minutes for validations of TTY load 0002.

(d) Time delay, up to 4 minutes for validations of TTY load 4002.

(e) Load inventory summary request No. 1.

(f) Time delay, 1.5 minutes.

- (g) Test case, command terminate. HSD ERR 07.
- (h) PRM LD CLR 1201, 4201, 0002, 4002.
- (i) Load inventory summary request No. 2.
- (3) Low-speed Input Test (Voiced) RPTL/ISSA-U/CDP
 - (a) Load inventory summary containing loads 0002, 1201, 4002, 4201.
 - (b) Load inventory summary containing no loads.

DDU
#13.

50.1.4.3 TLM CADFISS Tracks (AC Tape). Refer to Section 57. of these supplements for the track assignments contained in the CADFISS AS-506 AC validation tapes.

50.1.4.4 Tracking CADFISS

a. General

(1) All high-speed tracking will be conducted at 2.4 kbps (except ships which will be conducted at 1.2 kbps).

(2) High- and low-speed tracking tests will be run simultaneously for USB and C-band tracking, where applicable.

(3) Low-speed tracking CADFISS will be conducted with a DD (GSFC only) routing indicator.

b. Track L or H/BOR-RA/U-CM or LM (Refer to E&O Manual Procedures). Send 3.5 minutes of data for single-station configuration and 6.5 minutes for dual-station configuration.

c. For all CADFISS testing, the mission ID will be ~~as follows:~~ 0

(1) Low-speed Data (TTY)

<u>Type</u>	<u>Character</u>	<u>Value</u>
USB	58	7
DSIF	58	7
Ship	58	7
C-band	15 MSB	0

(2) High-speed Data

<u>Type</u>	<u>Bits</u>	<u>Value</u>
USB	123 - 124 - 125	7
DSIF	123 - 124 - 125	7
	USB C-Band	
Ship	50 - 51 - 52 293 - 294 - 295	7
BDA FPQ-6	13	0
BDA FPS-16	14	0
C-band	22 - 23 - 24	7

50.2 MCC COMPUTER SUPPORT

50.2.1 GENERAL

The MCC Real-time Computer Complex (RTCC) will provide primary support for real-time computation of trajectory parameters in support of the mission. Radar and telemetry data received from the network stations will be processed by the RTCC and used to drive the various displays at MCC.

50.2.2 ACQUISITION MESSAGES

50.2.2.1 General

- a. The RTCC will generate and transmit acquisition messages at 30-minute intervals. The intervals will be based on GMT rather than GET.
- b. Acquisition messages will cover either the entire view period of the station or a 30-minute period, whichever is less. If the view period is longer than 30 minutes, the message will reflect a pseudo LOS at AOS +30 minutes. In the next acquisition message transmitted to that station, a pseudo AOS will be given. There will be no redundant points if multiple messages are required to cover a view period. The LOS of the final message will be the true LOS of that view period. The time period of this message may be less than 30 minutes.
- c. Messages will be generated and transmitted to stations between 30 and 60 minutes before an AOS (or pseudo AOS) for each vehicle.
- d. There are no criteria for governing which vehicle's acquisition message will be sent first if the acquisition of each vehicle is within the same 30-minute period. Each station will get a 29-point acquisition message labeled "CM" for the CSM or "LM" for the S-IVB or the LM vehicle.

50.2.2.2 6-Point Acquisition Messages. The RTCC will transmit 6-point acquisition messages for all USB stations' vehicles (except stations having 85-foot antennas). The format for the MCC 6-point acquisition message is described in Section 33 of the NOD.

50.2.2.3 29-Point Acquisition Messages. The RTCC will generate 29-point acquisition messages for all vehicles for all USB stations, including prime and wing stations with 85-foot antennas, and Apollo ships. The format for the 29-point acquisition message is given in Section 33 of the NOD.

50.2.2.4 IRVs

- a. The RTCC will generate IRVs for BDA, CRO, all DOD stations, and Apollo ships.
- b. The format for the IRV is given in Section 33 of the NOD.

50.2.2.5 Apollo Maneuver Information Messages. These messages will normally be transmitted by MCC to GSFC and GCNV 60 minutes prior to Apollo maneuvers, and will be used to update the GRTS and ETR AOCC-IS with orbital data changes. The format for the Apollo maneuver information message is described in Section 33 of the NOD.

50.3 ETR RTCS COMPUTER SUPPORT

50.3.1 HIGH-SPEED DATA

50.3.1.1 During the launch phase the Real-time Computing System (RTCS) will process radar data from MLA, GTK, ANT, PAT, CNV, and the BDA FPQ-6 and FPS-16 and transmit them via the LTDS to MCC and CIF. This same data will also be transmitted to GSFC.

50.3.1.2 During the early launch phase, booster-vehicle guidance-telemetry data will be processed as an input source by the RTCS.

50.3.1.3 During the coverage period of the earth-orbital phase, RTCS will process MLA or PAT, BDA, and ANT high-speed data and transmit them via the LTDS to MCC as required. Only the unprocessed best radar source will be transmitted. The weighing and priority used in the best radar source will be coordinated with MCC prior to launch.

50.3.2 LOW-SPEED DATA

50.3.2.1 During the launch phase MLS, PAT, ANT, and GTK radar data will be converted onstation to 38-character TTY data and transmitted to the RTCS for relay to GSFC and MCC.

50.3.2.2 During the earth orbital phase, ETR radar stations will convert their radar data onstation to 38-character and transmit to RTCS for relay to GSFC and MCC.

50.3.3 VEHICLE IDENTIFICATION

During the mission, the radar tracking data will identify the vehicle being tracked according to the following code assignments:

<u>Vehicle/Mode</u>	<u>Vehicle ID No.</u>	<u>TTY Character</u>
S-IVB/IU Beacon	4	4
CSM Skin	5	\$ (Dollar)
S-IVB/IU Skin	4	. (Period)

50.3.4 ARIA ACQUISITION MESSAGE

The technical laboratory will provide acquisition messages containing TSP time, azimuth, elevation, and range to be transmitted to AOCC for relay to ARIA. The acquisition messages will be generated from existing ephemeris at the times required. The ephemeris will be updated using the IRVs and Apollo maneuvering vectors as received from MCC, and ETR tracking data as applicable. Requests for advance IRVs and Apollo maneuvering vectors for real-time planning will be coordinated via voice loops with MCC RTCC data select.

50.4 ETR AOCC-IS (AOCC-INFORMATION SYSTEM) COMPUTER SUPPORT

50.4.1 ARIA ORBITAL ACQUISITION

The AOCC-IS will generate the ARIA Instrumentation Almanacs and update various AOCC displays as required, based on the best available mission data. The mission data to be used will consist of updated MCC-RTCC IRVs, and Apollo maneuver infor-

mation messages. The MCC-RTCC data select will be the contact at MCC for coordination of IRVs and Apollo maneuver information messages. The AOCC computer advisor, call sign: ARIA-Computer, will be the contact at AOCC for ETR interface. Voice coordination between the two computers' positions will be accomplished on the GOSS-6 loop, refer to Section 61 ARIA acquisition data.

50.4.2 ARIA REENTRY ACQUISITION

An update of reentry parameters in the ARIA reentry format will be transmitted via teletype, priority precedence, from MCC for use by AOCC-IS approximately 5 hours prior to reentry. Additional reentry parameters may be required by the AOCC for advance ARIA planning and positioning prior to the reentry phase of the mission. All queries regarding reentry messages will be referred to the MCC-Track on the IP computer coordination loop, and the ARIA-Computer/AOCC. The format for the ARIA reentry message is shown in Section 33 of the NOD.

The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that proper record-keeping is essential for the integrity of the financial system and for the ability to detect and prevent fraud. The document also notes that records should be kept for a sufficient period of time to allow for a thorough review in the event of an audit.

The second part of the document describes the various methods used to collect and analyze data. It includes a discussion of the different types of data that can be collected, such as financial data, operational data, and customer data. It also describes the various techniques used to analyze this data, including statistical analysis, data mining, and machine learning. The document concludes by noting that the use of these methods can help organizations to identify trends, detect anomalies, and make more informed decisions.

Supplement to Section 51

Communications

SUPPLEMENT TO SECTION 51. COMMUNICATIONS (PDC # 33)

SECTION 51.1 OF THE NOD APPLIES IN GENERAL FOR THE MISSION. EXCEPTIONS OR ADDITIONS THERETO AS APPLICABLE TO THIS MISSION ARE COVERED BELOW.

51.1.1 HIGH SPEED DATA (HSD).

THE FOLLOWING CIRCUITS AND DATA RATES ARE APPLICABLE AS INDICATED.

51.1.1.1 NETS 4 AND 6. EACH GROUND USB STATION AND THE VAN, RED AND MER WILL BE CONFIGURED FOR REAL-TIME 2.4 KBPS DATA TRANSMISSION. IF NET 4 TRANSMIT TO THE STATION IS LOST, THE NASCOM COMM MANAGER WILL NOTIFY MCC COMM CONTROL/NETWORK CONTROLLER, CONCURRENTLY, NASCOM WILL EFFECT RESTORATION ON THE TRANSMIT SIDE OF NET 6 TO THE STATION, GSFC NASCOM DATA LINK WILL COORDINATE WITH THE STATION OFF-NET ON ITS NET 3 CIRCUIT TO PATCH THE STATION'S RECEIVE (AUDIO) SIDE OF NET 6 TO THE NORMAL MODEM/DTU COMMAND INTERFACE EQUIPMENT. (FOR THIS MISSION, HIGH SPEED COMMANDS TO THE SHIP RED WILL NORMALLY BE ON NET 6. RESTORATION WOULD BE EFFECTED ON NET 4 TRANSMIT TO RED).

51.1.1.2 NET 5. EACH GROUND USB STATION AND THE VAN, RED AND MER WILL BE CONFIGURED FOR REAL-TIME DATA TRANSMISSION. DATA RATES WILL BE 2.4 KOPS FOR LAND BASED STATIONS AND 1.2 KEPS FOR VAN, RED AND MER.

NOTES:

1. CRO C-BAND WILL SHARE CRO NET 5 CIRCUIT ON A NON-SIMULTANEOUS BASIS AS REQUESTED BY THE MCC.
2. HAW C-BAND WILL SHARE HAW NET 5 CIRCUIT ON A NON-SIMULTANEOUS BASIS AS REQUESTED BY THE MCC.
3. HIGH SPEED DATA FROM APOLLO WING STATIONS WILL SHARE, ON A NON-SIMULTANEOUS BASIS, THE NET 5 CIRCUIT FROM THE RESPECTIVE PRIME STATION AS REQUIRED AND COORDINATED BETWEEN THE MCC AND THE PRIME STATION M&O. THE NORMAL CONFIGURATION WILL BE FOR THE WINGS TO FORWARD THEIR DATA VIA THE INTRA-STATION MICROWAVE SYSTEM TO THE PRIME STATION.
4. LOW SPEED (TTY) TRACKING DATA IS REQUIRED SIMULTANEOUSLY WITH HIGH SPEED DATA FROM THE ABOVE STATIONS.
5. LOW SPEED (TTY) TRACKING DATA IS REQUIRED SIMULTANEOUSLY FROM BOTH APOLLO PRIME AND APOLLO WING STATIONS.
6. LOW SPEED (TTY) TRACKING DATA IS REQUIRED SIMULTANEOUSLY FROM CRO USB AND C-BAND SYSTEMS. THIS WILL BE SUPPORTED IN CONJUNCTION WITH LOW SPEED VALS BY UTILIZING THREE OFF-STATIONS CIRCUITS.

PARAS 51.1.1.3, 51.1.2, 51.1.3 N/A TO HSK.

51.1.4.1 BIOMED DATA CIRCUIT UTILIZATION
DURING THE MISSION NET 3 OR NET 5 WILL BE USED FOR BIOMED DATA TRANSMISSION TO THE MCC. (REFERENCE MOD SUPPLEMENT PARA. 40.3 FOR NOMINAL REMOTING PROCEDURES). THE NASCOM CIRCUIT CONFIGURATION WITH THE STATIONS WILL BE COORDINATED AND CONTROLLED BY THE NASCOM COMMUNICATIONS MANAGER IN COORDINATION WITH MCC COMM CONTROL. (NASCOM COMM MANAGER (VOICE CONTROL) WILL KEEP THE NOM ADVISED IN GENERAL OF RECONFIGURATIONS INVOLVING NET 3). DEPENDING ON THE STATION CONCERNED AND THE COMMUNICATIONS NETWORK STATUS, NASCOM MAY REQUIRE UP TO 20 MINUTES TO RECONFIGURE NET 5 FOR BIOMED DATA OR TO RECONFIGURE IT BACK TO A HIGH SPEED TRACK INTERFACE. DURING THE MISSION PERIODS WHEN NET 5 WILL BE USED FOR BIOMED DATA, THE "H MINUS 70" BIOMED REMOTING TESTS FROM A STATION WILL BE ON AVAILABLE CIRCUITRY AT THE DISCRETION OF THE NASCOM COMMUNICATIONS MANAGER (VOICE CONTROL) AND THEREFORE MAY NOT NECESSARILY BE HANDLED ON NET 5.

51.1.5 SUPPORT OF SPACECRAFT VIDEO

51.1.5.1 FACILITIES PROVIDED. IN ADDITION TO ALDS VIDEO, NASCOM FURNISHED FACILITIES WILL SUPPORT VIDEO TRANSMISSIONS FROM GDS, MAD AND HSK/PARKES DURING VARIOUS MISSION PHASES AS REQUIRED. LAND-LINE AND MICROWAVE FACILITIES WILL BE UTILIZED TO EXTEND GDS TO THE MCC. FOR MAD AND HSK/PARKES, LAND-LINE AND MICROWAVE FACILITIES IN CONJUNCTION WITH INTELSAT III SERIES SATELLITES WILL BE USED FOR VIDEO EXTENSION TO THE MCC.

51.1.5.2 FACILITY AVAILABILITY. IN ORDER TO ENSURE THE AVAILABILITY OF VIDEO FACILITIES AS DESIRED DURING THE MISSION, ESPECIALLY THOSE FROM MAD AND HSK/PARKES, THE NASCOM COMMUNICATIONS MANAGER WILL COORDINATE WITH MCC COMM CONTROL/NETWORK CONTROLLED IN ACCORDANCE WITH THE "MCC OPERATIONS/NASCOM OPERATIONS COMMUNICATIONS CONTROL INTERFACE PROCEDURES" DOCUMENT DATED MAY 8, 1969, AS UPDATED FOR THE APOLLO 11 MISSION. IN GENERAL THESE PROCEDURES PROVIDE THAT:

- A. THE NETWORK CONTROLLER WILL SEND A POST-LAUNCH MESSAGE TO THE NASCOM COMMUNICATIONS MANAGER UPDATING THE PRE-LAUNCH SCHEDULE PROJECTION, INITIALLY FURNISHED BY MSC, FOR VIDEO SERVICE FROM THE MISSION STATIONS CONCERNED.
- B. CHANGES/ADDITIONS/DELETIONS TO THE POST-LAUNCH UPDATE WILL, FOR GDS, BE PASSED DIRECTLY BY MCC COMM CONTROL TO THE COMMERCIAL CARRIER, WITH SUBSEQUENT ADVISORY INFORMATION PASSED TO NASCOM COMMUNICATIONS MANAGER.
- C. FOR MAD AND HSK/PARKES, DEVIATIONS DESIRED BY MCC FROM THE POST-LAUNCH SCHEDULE UPDATE WILL FIRST BE FORWARDED BY MCC COMM CONTROL FOR CONCURRENCE TO THE NASCOM COMMUNICATIONS MANAGER. UPON RECEIPT OF THE CONCURRENCE, MCC COMM CONTROL ON BEHALF OF THE NASCOM COMMUNICATIONS MANAGER WILL PROVIDE TO THE COMMERCIAL CARRIER REPRESENTATIVE IN THE MCC, THE NEW SCHEDULE. THESE CHANGES MAY BE REQUESTED AND CONCURRED IN VERBALLY, HOWEVER, MCC COMM CONTROL WILL PREPARE A MESSAGE FOR NETWORK CONTROLLER SIGNATURE, CONFIRMING THE VERBAL ARRANGEMENTS.
- D. THE NASCOM COMMUNICATIONS MANAGER WILL ACKNOWLEDGE BY MESSAGE, ALL MESSAGES RECEIVED FROM THE NETWORK CONTROLLER CONCERNING VIDEO SCHEDULES.

51.1.5.3 TECHNICAL CONTROL. CIRCUIT TECHNICAL CONTROL OF THE VIDEO CIRCUITS FROM THE STATIONS TO MCC WILL BE THE RESPONSIBILITY OF MCC COMM CONTROL ONCE THE CIRCUITS/FACILITIES HAVE BEEN REQUESTED AND PROVIDED AS COVERED ABOVE. (NOTE: THE CIRCUIT TO

AUSTRALIA IS THE RESPONSIBILITY OF MCC COMM CONTROL ONLY AS FAR AS THE SYDNEY VIDEO SWITCH; THE SYDNEY VIDEO SWITCH OPERATOR WILL BE RESPONSIBLE FOR INTRA-AUSTRALIAN VIDEO CIRCUITS AS COVERED BELOW). THE NASCOM COMMUNICATIONS MANAGER WILL ASSIST MCC COMM CONTROL IN THIS FUNCTION WHEN SO REQUESTED AND WILL ADVISE MCC COMM CONTROL OF ANY COMMUNICATIONS PROBLEMS WHICH IMPACT CURRENT OR PROJECTED VIDEO TRANSMISSIONS.

51.1.5.4 SYDNEY VIDEO SWITCH. FOR THIS MISSION, NASCOM HAS PROVIDED A VIDEO SWITCHING CAPABILITY AT SYDNEY, AUSTRALIA, TO BE OPERATED AND MAINTAINED BY GSFC PERSONNEL. IT WILL BE USED TO INTERFACE HSK AND PARKES VIDEO (ONE FOR THE OTHER) TO THE INTELSAT III SATELLITE AND LANDLINE/MICROWAVE VIDEO FACILITIES TO MCC. THE SYDNEY VIDEO SWITCH OPERATOR RESPONSIBILITIES WILL INCLUDE THE FOLLOWING:

A. GENERAL. COORDINATE WITH THE HSK M&O/SCAN CONVERTER OPERATOR, THE SCAN CONVERTER OPERATOR ("SYDNEY SCAN") AT SYDNEY AND GSFC OPERATIONS PERSONNEL AT PARKES, AUSTRALIA, VIA A NASCOM PROVIDED VOICE ORDERWIRE (NET 7) IN ESTABLISHING A SATISFACTORY VIDEO INTERFACE FROM THESE LOCATIONS TO THE SYDNEY VIDEO SWITCH. (THIS ORDERWIRE WILL ALSO BE USED FOR INTER-STATION COORDINATION BETWEEN HSK, PARKES AND THE SYDNEY SCAN CONVERTER OPERATOR FOR MATTERS RELATING TO VIDEO/TELEMETRY EQUIPMENT SUPPORT). THE SYDNEY VIDEO SWITCH OPERATOR WILL USE THE VOICE CALL-SIGN "SYDNEY VIDEO" WHEN COORDINATING WITH THE STATIONS ABOVE AND WITH "HOUSTON TV" ON NET 2.

B. CIRCUIT CONFIGURATION/STATIONS TO SYDNEY VIDEO SWITCH. NOT LATER THAN 30 MINUTES PRIOR TO START OF HSK/PARKES VIDEO CIRCUIT REQUIREMENTS TO MCC, SYDNEY VIDEO WILL HAVE ESTABLISHED AND LINED UP VIDEO CIRCUITS FROM HSK/PARKES TO SYDNEY AND WILL KEEP THE CIRCUITS UNDER CONTINUOUS SURVEILLANCE. SYDNEY VIDEO WILL COORDINATE WITH THE STATIONS AND REQUEST TEST SIGNALS AS REQUIRED TO ATTAIN THIS CAPABILITY. THE STATIONS WILL RESPOND IN A TIMELY MANNER TO ENSURE THIS TIME-LINE IS MET.

C. CIRCUIT CONFIGURATION/SYDNEY VIDEO TO MCC. AT THE START OF THE CALL-UP TIME OF THE OVERALL CIRCUIT TO MCC, SYDNEY VIDEO WILL BE SENDING A "MULTIBURST" WITH WHITE LEVEL AND BURSTS AT 100, SYNC AT MINUS 40 AND "SET-UP" AT 7.5. "HOUSTON TV" WILL VERIFY HE IS ACTUALLY SEEING THE SYDNEY VIDEO SIGNAL BY REQUESTING SYDNEY VIDEO VIA NET 2 TO CHANGE TO "STAIR-STEP" THEN BACK TO "MULTIBURST". SUBSEQUENTLY, SYDNEY VIDEO (TIME PERMITTING) WILL CUT HSK AND PARKES THROUGH, ONE AT A TIME, TO GIVE "HOUSTON TV" A LOOK AT TEST SIGNALS FROM EACH OF THESE STATIONS. FOLLOWING THIS, SYDNEY VIDEO WILL PUT MULTIBURST ON-LINE AND LEAVE IT TILL ACQUISITION OF SPACECRAFT VIDEO FROM HSK/PARKES. (NOTE: IF ONLY ONE OF THESE STATIONS IS INVOLVED IN REMOTING SPACECRAFT VIDEO TO SYDNEY SWITCH FOR ANY REASON, SYDNEY VIDEO WILL LEAVE THE TEST SIGNAL FROM THAT STATION CUT THROUGH TO MCC PRIOR TO STATION ACQUISITION/VIDEO TRANSMISSION).

D. ACQUISITION OF SPACECRAFT VIDEO.

(1). AT ACQUISITION OF SPACECRAFT VIDEO, HSK/PARKES WILL ANNOUNCE SAME ON THE INTER-STATION ORDERWIRE (NET 7). IF

51.1.4.2 NET 3/NET 5 - CSM/LM UNDOCKING TO CSM/LM RENDEVOUS DURING THE H-70 INTERFACE FOR ALL STATIONS HAVING VIEW IN THIS PHASE, GSFC WILL RUN THE HIGH SPEED TRACKING CADFISS ON NET 5 AND THE BIOMED INTERFACE ON NET 3. STATIONS WILL REMAIN IN THIS CONFIGURATION UNTIL FINAL LOS IN THIS PHASE.

BOTH STATIONS OUTPUT VIDEO, SYDNEY VIDEO WILL SELECT THE BEST SOURCE FOR EXTENSION TO MCC AND ADVISE HOUSTON TV ON NET 2. HOUSTON TV WILL ACKNOWLEDGE RECEPTION OF SIGNAL AT MCC. IF SOURCE BEING EXTENDED TO MCC FAILS BETWEEN SOURCE AND SYDNEY, SYDNEY VIDEO WILL IMMEDIATELY SWITCH TO THE OTHER SOURCE AND ADVISE HOUSTON TV ON NET 2. (IF THE NON-SELECTED SOURCE SHOULD FAIL AT ANY TIME, SYDNEY VIDEO WILL ALSO ADVISE HOUSTON TV OF THIS OCCURRENCE ON NET 2).

(2). UPON REPORT OF A VIDEO CIRCUIT FAILURE BY HOUSTON TV ON NET 2, SYDNEY VIDEO WILL ADVISE WHETHER THE FAILURE IS BETWEEN SOURCE AND SYDNEY OR BETWEEN SYDNEY AND THE MCC. IF THE TROUBLE IS BETWEEN THE SOURCE AND SYDNEY, SYDNEY VIDEO WILL VERIFY IF VIDEO IS LEAVING THE SOURCE AND REFER ANY SOURCE PROBLEM BACK TO THE STATION M&O. IF THE SOURCE OUTPUT IS NORMAL, SYDNEY VIDEO WILL INITIATE CORRECTIVE ACTION BY THE APPROPRIATE AUSTRALIAN GOVERNMENT COMMUNICATIONS PERSONNEL (PNC). IF THE TROUBLE IS BETWEEN SYDNEY VIDEO AND THE MCC, SYDNEY VIDEO WILL ADVISE HOUSTON TV OF SAME WHO WILL IN TURN INITIATE RESTORAL ACTION THROUGH MCC COMM CONTROL. (SYDNEY VIDEO WILL REPORT THE OUTAGE ON AN ADVISORY BASIS TO THE LOCAL AUSTRALIAN CARRIER).

(3). FOR A VIDEO CIRCUIT OUTAGE WITHIN AUSTRALIA, SYDNEY VIDEO WILL MAKE THE INITIAL REPORT TO HOUSTON TV ON NET 2 AS COVERED ABOVE. SUBSEQUENT STATUS REPORTS AND/OR FINAL RESTORATION REPORT WILL BE FORWARDED TO THE NASCOM COMMUNICATIONS MANAGER WHO IN TURN WILL RELAY THE INFORMATION TO MCC COMM CONTROL FOR DISSEMINATION IN THE MCC.

Supplement to Section 52

VHF Acquisition Systems

SUPPLEMENT TO SECTION 52. VHF ACQUISITION SYSTEMS

52.1 GENERAL

Acquisition aid and other VHF telemetry (TLM) receiving antennas will track the S-IVB/IU, provide VHF voice coverage (296.8 MHz) from the CSM, and provide pointing data to other steerable antennas as required.

52.2 LINK ASSIGNMENTS

The prime tracking links are:

<u>Vehicle</u>	<u>Freq (MHz)</u>	<u>Power (watts)</u>	<u>Minimum Bandwidth (kHz)</u>
IU	245.3	15	100
S-IVB	258.5	15	100
S-II	248.6	15	100

52.3 ACQUISITION ANTENNA CONFIGURATION

Stations will conform to Section 52 of the NOD with respect to their individual tracking capabilities. Section 57 of these supplements contains individual station acquisition aid antenna sources for receiving VHF links. The ETR antenna assignments will be in accordance with the DOD Mission Operations Directives. Diversity polarization reception will be used to support the S-IVB/IU TLM links where applicable.

52.4 ANTENNA TRACKING REQUIREMENTS52.4.1 LAND STATIONS

After S-IVB/CSM separation, dual-capability stations may be required to track both vehicles simultaneously to provide VHF A/G voice remoting from the CSM and VHF TLM data from the S-IVB/IU. Stations having only one VHF system will track the CSM and provide VHF voice coverage.

52.4.2 SHIPS SUPPORT

MER, RED, and VAN will use the 4-1 antenna and HTV the 5-1 antenna to track the IU on the 245.3-MHz link (prime) and the S-IVB on the 258.5-MHz link (secondary).

52.5 AUTOTRACKING

Autotracking the S-IVB/IU will be done in the cross-correlation mode.

52.6 RECORDING AND CALIBRATIONS

Refer to paragraph 52.4 of the NOD for recorder channel assignments and calibration procedures.

52.7 EARTH ORBITAL CONTINGENCY

In the event of an earth orbital rendezvous contingency, stations will configure their station equipment with the transmit and prime VHF receive antenna assigned to the vehicle listed in column 1 of the SCMs A/G section. For dual VHF antenna stations, the second VHF receive antenna will track the opposite vehicle to ensure continuous receive capability.

Supplement to Section 53

Radar

SUPPLEMENT TO SECTION 53. RADAR

53.1 MISSION PROFILE

53.1.1 S-IVB/IU

The MSFN C-band radars will track the C-band transponder from launch until battery depletion, (approximately 10 to 12 hours after launch) or until slant range exceeds system capabilities.

53.1.2 CSM

The CSM will not carry a C-band transponder. Skin tracking of the CSM will be on a contingency basis only.

53.2 MISSION SUPPORT

53.2.1 LAUNCH SUPPORT

Table 53-1 shows the tentative MSFN C-band radar tracking requirements for launch support. The final tracking assignments for launch support will be issued by ETR.

Table 53-1. Launch Support Requirements

Station	Radar	Assignment
ANT*	FPQ-6	IU (TTY and HSD)
ASC*	TPQ-18	IU (TTY and HSD)
BDA*	FPQ-6	IU (TTY and HSD)
BDA*	FPS-16	IU (TTY and HSD)
CNV	FPS-16	Prelaunch weather balloon
GTK*	TPQ-18	IU (IP smooth)
MLA*	TPQ-18	IU (TTY and HSD)
PAT*	FPQ-6	IU (TTY and HSD)
VAN*	FPS-16	IU (TTY and HSD)

*Skin track the CSM in the event of an abort contingency.

53.2.2 POSTLAUNCH SUPPORT

Table 53-2 indicates the C-band radars required for postlaunch support. Tracking assignments and data transmission requirements will be indicated in the radar tracking schedule.

Table 53-2. Postlaunch Support Requirements

Station	Radar	Station	Radar
ANT	FPQ - 6	MER	FPS - 16
ASC	TPQ - 18	MLA	TPQ - 18
BDA	FPQ - 6	PAT	FPQ - 6
BDA	FPS - 16	PRE	MPS - 25
CAL	TPQ - 18	RED	FPS - 16
CRO	FPQ - 6	TAN	FPW-16 (v)
GTK	TPQ - 18	VAN	FPS - 16
HAW	FPS - 16		
HTV	FPS - 16 (v)		

53.2.3 REENTRY SUPPORT

The HTV will provide reentry support.

53.3 RADAR OPERATIONAL PARAMETERS

53.3.1 S-IVB/IU TRANSPONDERS

The S-IVB/IU will contain two Motorola SST-135C transponders. Both transponders will be simultaneously interrogated by a coded double pulse and will respond with a single RF pulse of fixed frequency. The S-IVB/IU will have two antennas, one for each transponder, placed approximately 180 degrees apart. Parameters for the C-band transponders aboard the S-IVB/IU are listed in table 53-3.

Table 53-3. C-band Transponder Parameters

Parameter	Characteristic
Interrogate frequency	5690 MHz
Transpond frequency	5765 MHz
Pulse spacing	$8 \pm 0.25 \mu\text{sec}$
Beacon delay	$3 \mu\text{sec}$ (492 yds)
Pulse width	$1.0 \mu\text{sec}$
Transponder recovery time	$62 \mu\text{sec}$
S/C antenna polarization	Circular (RH)
Transponder power	400 watts peak

53.3.2 ANTENNA POLARIZATION

All radars will use linear polarization during track of all transponders. C-band radars will skin track using circular polarization, where the capability exists.

53.3.3 PULSE REPETITION FREQUENCY (PRF)

All radars will use a 160 PRF while beacon tracking.

53.3.4 MASTER OSCILLATOR FREQUENCY

All radars which have 82-kHz oscillators will be set to 81964.270 Hz. No adjustment is required for radars using the 5.24571328-MHz standards.

53.4 HIGH-SPEED DATA

In addition to low-speed teletype data, the stations listed in table 53-4 are required to provide high-speed real-time data during the mission. The tracking schedules will indicate when high-speed data is to be transmitted. Sample rates, in samples per second, to be transmitted from the stations are also listed in table 53-4. When high-speed data is being transmitted, all stations will ensure that low-speed data is also being transmitted at a rate of one sample per six seconds.

Table 53-4. High-speed Data

Station	Sample Rate
ASC	10*
BDA	10*
GTK	10*
HAW	10
CRO	10
ANT	10*
MLA	10*
PAT	10*
MER	2
RED	2
VAN	2

*High-speed data from these stations will be transmitted to the RTCC at the rate of ten samples per second via the ALTDS when selected as best source.

53.5 DATA TRANSMISSION FORMAT

53.5.1 The radar data ID assignments are given in table 53-5. For these assignments, land stations will use character 4 in the low-speed TTY data format and data bits 15, 17, 18, and 19 in the high-speed data format. The Apollo ships will use characters 6 and 9 in the low-speed data format and bits 296, 297, 298, and 299 in the high-speed data format.

Table 53-5. Radar Data ID Assignments

Type	LSD (TTY) Land Stations	LSD (TTY) Ships	HSD Land Stations	HSD Ships
CSM skin	\$	6	1101	1110
S-IVB/IU beacon	4	3	0100	0011
S-IVB/IU skin	. (period)	3	1100	1011
Test message	8			
Last message	9			

53.5.2 The mission ID will be one. The low-speed character and high-speed bits will be set according to table 53-6.

Table 53-6. Mission ID Assignments

Assignments	LSD (TTY) Character	HSD Bits
Land Station	15 MSB = 1	Bits <u>22-23-24</u> ID 1 0 0
BDA	15 MSB = 1	Bits <u>13-14</u> ID 1 1
Ships	*58 MSB = 1	Bits <u>293-294-295</u> ID 1 0 0 **Bits <u>50-51-52</u> ID 1 0 0

*Character 58 will be a 4.

**USB bits 50-51-52 must be set even if only C-band HSD is being transmitted.

Supplements to Section 54

USB

SUPPLEMENT TO SECTION 54. UNIFIED S-BAND (USB)

54.1 GENERAL

54.1.1 STATION SUPPORT

54.1.1.1 USB. USB support will be provided by ACN, ANG, BDA, CRO, CYI, GBM, GDS, GWM, GYM, HAW, HSK, HTV, MAD, MER, MIL, RED, VAN, TEX, GDSX, HSKX, and MADX.

54.1.1.2 210-foot Antenna Stations. The 210-foot Mars antenna located at Goldstone, California, and the 210-foot antenna at the Australian National Radio Astronomical Observatory located at Parkes, New South Wales, will be utilized to acquire FM information during lunar surface activity.

54.1.1.3 MIL. MIL will provide prelaunch support and transponder measurements in accordance with AS-506 pad support procedures. During prelaunch checkout and the launch phase, the JPL DSS-71 antenna will be used as a backup to MIL.

54.1.1.4 EASEP. The MSFN will provide support for the Early Apollo Surface Experiment Payload (EASEP) starting with its deployment on the lunar surface. The telemetry bit rates will be 1060 (normal) or 530 (contingency) bits per second. The uplink carrier frequency will be at 2119 MHz and the downlink carrier frequency at 2276.5 MHz. The EASEP will consist of a Passive Seismic Experiment (PSE) and a passive laser retroreflector. Power for the PSE is provided by solar panels so support will only be required during the lunar day. (Refer to Annex C to the NOD for EASEP support procedures during mission and nonmission periods.)

54.1.2 STATION OPERATION

Section 40 of the NOD contains standard procedures for operating USB interface equipment. Section 54 of the NOD outlines the USB acquisition procedures to be used.

54.2 MISSION SUPPORT

54.2.1 UPLINK POWER LEVELS

54.2.1.1 Thirty-foot Antenna Stations and HTV

a. Single Uplink. Stations assigned a single uplink carrier will radiate 10 kw for all mission phases. This power level also applies to HTV throughout the mission.

b. Dual Uplink. With the exception of MIL during the launch phase, all 30-foot stations will restrict the power of each carrier to 2 kw when required for simultaneous uplink.

Note

The power amplifier will be operated at a beam voltage of 20 kv (or maximum) and the uplink power level adjusted to the desired output by varying the RF drive.

54.2.1.2 Eighty-five-foot Antenna Stations

- a. Earth Orbital Phase. All 85-foot stations will radiate at 2 kw per carrier during the earth-orbital phase.
- b. Post-TLI. After TLI + 3 hours, all 85-foot stations will radiate at 10 kw per carrier for the remainder of the mission.
- c. Wing Stations (GDSX, HSKX, and MADX). Because of undesirable intermodulation products, simultaneous uplink of two carriers by the wing stations is prohibited.

Note

MCC may request any station to uplink at a 20 kw (or maximum) power level in the event of a contingency.

54.2.2 VEHICLE IDs

The vehicle IDs (object No.) will be as follows:

- a. TTY character 9 set to obtain the following, both at land stations and on ships:

S-IVB/IU	octal 3
CSM	octal 6
LM	octal 7

- b. HSD bits, set as follows, for land stations:

<u>Vehicle</u>	<u>17</u>	<u>18</u>	<u>19</u>
S-IVB /IU	0	1	1
CSM	1	1	0
LM	1	1	1

- c. HSD bits, set as follows, for ships:

<u>Vehicle</u>	<u>57</u>	<u>58</u>	<u>59</u>
S-IVB/IU	0	1	1
CSM	1	1	0
LM	1	1	1

54.2.3 MISSION IDs

The mission ID will be one. TTY character and high-speed bits will be set according to table 54-1. Ships USB high-speed bits must be set even though only C-band high-speed data is being transmitted.

Table 54-1. Mission ID Assignments

Assignments	TTY Char No. 58	HS Char No. 123	HS Char No. 124	HS Char No. 125
Fixed USB	4	1	0	0
Assignments	TTY Char No. 58	HS Char No. 50	HS Char No. 51	HS Char No. 52
Ships	4	1	0	0

54.3 RANGING CRITERIA

54.3.1 RANGE RECEIVER NORMALIZATION

54.3.1.1 CSM and LM Downlink

a. The CSM and LM downlink ranging mode indices expected for this mission are as follows:

Uplink Mode 1: 0.56 radians

Uplink Modes 4, 5, 6, and 8: 0.14 radians

b. Range receivers which are assigned to CSM or LM support should be normalized for 0.14 radians. If uplink Mode 1 is used, readjustment of the range receiver may be necessary.

Note

The system ranging delay data for all three vehicles will be supplied to the ships when it becomes available.

54.3.1.2 IU/CCS Downlink

a. The IU/CCS downlink ranging mode indices expected for this mission are as follows:

Uplink Mode 1: 0.44 radians

Uplink Mode 5: 0.23 radians

b. Range receivers which are assigned to IU/CCS support should be normalized for 0.23 radians. Mode 1 will be utilized only in the event of a contingency.

54.3.2 STATION DELAY MEASUREMENTS

The criteria for measuring station delays and transmitting data to GSFC are as follows:

a. Systems which are assigned to CSM support (NOD, Section 54) should be measured for ranging delay at CSM frequency and downlink mode indices. Mission uplink power levels are to be used at land stations; Apollo ships may use reduced power.

b. Systems which are assigned to IU or LM support (NOD, Section 54) should be measured for ranging delay at LM frequency and IU or LM downlink mode indices. Mission uplink power levels are to be used at land stations; Apollo ships may use reduced power.

c. All delay measurements should be made using the main paramp, simulated downlink mode indices, and a downlink signal level of -100 dbm. All USB stations and ships are to transmit the CSM, LM, and IU station delay data, expressed in octal range units, to: GCRT, NST-USB-DSC and GALA/PM-MO-RC. The data is required at GSFC no later than F-7 days.

54.3.3 AGC CURVE MEASUREMENTS (85-FOOT STATIONS)

Calibration information will be required daily, prior to support, for the main PM receiver of the prime and wing station (receiver 1 and receiver 5 respectively). Format of data will be a listing of signal strengths (as steps noted in paragraph 54.4.6.1 k of the NOD) versus the octal equivalent of the Analog Multiplexer Quantitizer (AMQ) output for those power levels. Calibration data will include both LM and CSM frequencies. This information will be teletyped to HNET/TRACK and GCEN/NST/USB using the appropriate mission precedence.

54.4 RECORDING ASSIGNMENTS

Note

USB stations will record, as applicable to each station, all available parameters listed in paragraphs 54.6.1 and 54.6.2. For parameters which cannot be recorded because of equipment non-availability, interface limitations (non-installed EIs, etc.), appropriate annotations should be made on the recording.

54.4.1 ANALOG AND EVENT RECORDERS

During the earth orbital phase, recorders will be run at a speed of 10 mm per second. After confirmed TLI, recorders will be run at 2 mm per second for the remainder of the mission.

Note

When support of LM or IU/S-IVB is no longer required, all recordings assigned which relate to those vehicles will be deleted.

54.4.1.1 Brush Analog Recorders

a. Recorder 1 (DSS #658)

<u>Pen No.</u>	<u>Event</u>	<u>Pen No.</u>	<u>Signal</u>
E1	NASA 28-bit time code	A1	Sys 2 xmitter power out (85-foot stations)
		A1	TR-104 rcvr AGC (single land stations)
E2	Sys 1 xmitter drive on	A2	Xmitter power output
E3	Sys 2 xmitter drive on	A3	Sys 1 range rcvr SPE
E4	Sys 1 range mode on	A4	Sys 2 range rcvr SPE

<u>Pen No.</u>	<u>Event</u>	<u>Pen No.</u>	<u>Signal</u>
		A4	Rcvr 2 FM AGC (single stations)
E5	Rcvr 1 loop filter oper	A5	Rcvr 1 acq voltage
E6	Rcvr 2 loop filter oper	A6	Rcvr 2 acq voltage
E7	Sys 2 PCM decom sync lock (ANG, BDA)		
E7	Rcvr 3 loop filter oper	A7	Rcvr 3 acq voltage
E8	Sys 2 modulation normal (ANG, BDA)		
E8	Rcvr 4 loop filter oper	A8	Rcvr 4 acq voltage
E9	NASA 28-bit time code	A8	Sys 2 exc acq sweep voltage (BDA only)

b. Recorder 2 (DSS #659)

Notes

1. Single stations may use this recorder in place of the Beckman.
2. BDA and ANG may use this recorder in place of the Beckman by eliminating the main and acq rcvr AGCs from the Beckman and transferring the remaining six analogs to pens A3 through A8 of this recorder.

<u>Pen No.</u>	<u>Event</u>	<u>Pen No.</u>	<u>Signal</u>
E1	NASA 28-bit time code	A1	Transponder AGC (sys 2)
E2	Sys 2 PCM decom sync lock	A2	Transponder SPE (sys 2)
E3	Sys 2 range mod on	A3	Rcvr 3 AGC
E4	Rcvr 3 loop lock	A4	Rcvr 3 SPE
E5	Sys 2 modulation normal	A5	Rcvr 3 FM AGC
E6	Rcvr 4 loop lock	A6	Rcvr 4 FM AGC
E7	Sys 2 synth loop lock	A7	Sys 2 exc acq sweep voltage
E8	Range rcvr 2 lock	A8	Sys 2 rng correlation voltage
E9	NASA 28-bit time code		

c. Recorder 3 (DSS #660)

<u>Pen No.</u>	<u>Event</u>	<u>Pen No.</u>	<u>Signal</u>
E1	NASA 28-bit time code	A1	Transponder AGC (sys 1)
E2	Sys 1 PCM decom sync lock	A2	Transponder SPE (sys 1)
E3	Antenna autotrack	A3	Rcvr 1 AGC
E4	Rcvr 1 loop lock	A4	Rcvr 1 SPE
E5	Sys 1 modulation normal	A5	Rcvr 2 AGC
E6	Rcvr 2 loop lock	A6	Rcvr 2 SPE

<u>Pen No.</u>	<u>Event</u>	<u>Pen No.</u>	<u>Signal</u>
E7	Sys 1 synth loop lock	A7	Sys 1 exc acq sweep voltage
E8	Range rcvr 1 lock	A8	Sys 1 rng correlation voltage
E9	NASA 28-bit time code		

54.4.1.2 Brush 200 Recorder or Beckman Analog Recorder (DSS #650)

<u>Pen No.</u>	<u>Signal</u>	<u>Pen No.</u>	<u>Signal</u>
1	Main rcvr X angle error*	5	Acq rcvr Y angle error*
2	Main rcvr Y angle error*	6	Acq rcvr AGC
3	Main rcvr AGC	7	Program X angle error*
4	Acq rcvr X angle error*	8	Program Y angle error*

*Wing stations will record hour angle and declination angle errors instead of X and Y.

54.4.1.3 Brush 100 Event Recorder (DSS #656)

<u>Event</u>	<u>Switch Position for Event Mark</u>	<u>Sys 1 Pen No.</u>	<u>Sys 2 Pen No.</u>
Exciter No. 1 VCO select	2	2	--
Exciter No. 2 VCO select	1	--	52
Synthesizer loop filter	OPERATE	3	53
Exciter status, CMD	ON	4	54
Exciter status, voice	ON	5	55
Exciter status, backup voice	ON	6	56
Rcvr No. 1 loop bandwidth	WIDE	10	60
Rcvr No. 1 loop bandwidth	MEDIUM	11	61
Rcvr No. 1 gain control	AGC	12	62
Rcvr No. 1 AGC bandwidth	WIDE	13	63
Rcvr No. 1 AGC bandwidth	MEDIUM	14	64
Rcvr No. 1 VCO select	1	15	65
Rcvr No. 1 VCO select	3	16	66
Rcvr No. 1 VCO select	4	17	67
Rcvr No. 1 TLM bandwidth	3.3 MHz	18	68
Rcvr No. 2 loop bandwidth	WIDE	21	71
Rcvr No. 2 loop bandwidth	MEDIUM	22	72
Rcvr No. 2 gain control	AGC	23	73
Rcvr No. 2 AGC bandwidth	WIDE	24	74
Rcvr No. 2 AGC bandwidth	MEDIUM	25	75
Rcvr No. 2 VCO select	1	26	76

<u>Event</u>	<u>Switch Position for Event Mark</u>	<u>Sys 1 Pen No.</u>	<u>Sys 2 Pen No.</u>
Rcvr No. 2 VCO select	3	27	77
Rcvr No. 2 VCO select	4	28	78
Rcvr No. 2 TLM bandwidth	3.3 MHz	29	79
Range rcvr loop bandwidth	WIDE	33	83
Range rcvr loop bandwidth	MEDIUM	34	84
Range rcvr input selector	RCVR 1	35	85
PM TLM demod loop lock	IN	40	90
FM TLM demod loop lock	IN	41	91
PM voice demod loop lock	IN	42	92
FM voice demod loop lock	IN	43	93
Antenna acq track	ON	48	--
Antenna program track	ON	49	--
Antenna slave track	ON	50	--
NASA 28-bit time code	--	1	100

54.4.1.4 Supplemental Systems Monitor Patching

a. M&O Console Events. Those stations which have EI 3250 installed will not complete the following patching, but will patch the events directly to the recorder pens as applicable.

<u>Event</u>	<u>From</u>	<u>To</u>	<u>Event</u>	<u>From</u>	<u>To</u>
Sys 1 mod selector norm	10N	2Y	Sys 2 mod selector norm	34N	27W
	10P	2Z		34P	27X
	1Y	21G		25Y	19G
	1Z	21H		25Z	19H
Sys 1 ranging mod on	10J	2W	Sys 2 ranging mod on	34J	25W
	10K	2X		34K	25X
	5Y	21C		27Y	19C
	5Z	21D		27Z	19D
Sys 1 xmitter drive on	10L	3W	Sys 2 xmitter drive on	34L	26Y
	10M	3X		34M	26Z
	1W	17A		26W	17C
	1X	17B		26X	17D

b. Xmitter On Status to Udata Buffer

<u>Event</u>	<u>From</u>	<u>To</u>	<u>Event</u>	<u>From</u>	<u>To</u>
Sys 1 xmitter on	3Y	21Y	Sys 2 xmitter on	29Y	22Y
	3Z	21Z		29Z	22Z

c. Target A (CSM) Target B (LM/IU) Tracking Indication to Acq Bus and Event Recorder

<u>Event</u>	<u>From</u>	<u>To</u>	<u>Event</u>	<u>From</u>	<u>To</u>
Rcvr 1 VCO select 1	9Q	13J			
	9R	13K			
Rcvr 1 VCO select 3	13L	12Y	Rcvr 1 VCO select 4	9Q	13N
	13M	12Z		9U	13P
	9T	13Z			
	9Q	18Y			

d. S/C AGC and SPE. The following patching will configure the system monitor patch panel so that the (CSM) AGC and SPE will drive the remote meters on exciter No. 1 and the (LM/IU) AGC and SPE will drive the remote meters on exciter No. 2.

(1) All stations except BDA, HAW, TEX, GDSX, HSKX, and MADX

<u>Parameter</u>	<u>From</u>	<u>To</u>
No. 1 AGC	7-A	8-A, 15-A, 25-A
	7-B	8-B, 15-B, 25-B
No. 1 SPE	7-C	8-C, 15-C, 25-C
	7-D	8-D, 15-D, 25-D
No. 2 AGC (if required)	7-E	8-E, 13-A, 23-E
	7-F	8-F, 13-B, 23-F
No. 2 SPE (if required)	7-G	8-G, 13-C, 23-C
	7-H	8-H, 13-D, 23-D

(2) BDA, HAW, and TEX

<u>Parameter</u>	<u>From</u>	<u>To</u>
No. 1 AGC	7-A	8-B, 15-A, 24-D
	7-B	8-A, 15-B, 24-C
No. 1 SPE	7-C	8-D, 15-C
	7-D	8-C, 15-D
No. 2 AGC (if required)	7-E	8-F, 13-A, 24-F
	7-F	8-E, 13-B, 24-E
No. 2 SPE (if required)	7-G	8-H, 13-C
	7-H	8-G, 13-D

Note

On the Brush recorder at BDA, HAW, TEX, and 85-foot wing stations, place the polarity NORMAL/REVERSE switch in the REVERSE position for recorders 1 and 2, channels 1 and 2.

(3) GDSX, HSKX, and MADX

<u>Parameter</u>	<u>From</u>	<u>To</u>
No. 1 AGC	7-A	8-B, 15-A, 23-F
	7-B	8-A, 15-B, 23-E
No. 1 SPE	7-C	8-D, 15-C, 23-H
	7-D	8-C, 15-D, 23-G
No. 2 AGC	7-E	8-F, 13-A, 25-F
	7-F	8-E, 13-B, 25-E
No. 2 SPE	7-G	8-H, 13-C, 25-H
	7-H	8-G, 13-D, 25-G

e. Downlinking. The CSM PCM bit stream will contain both the AGC and SPE when downlinking the HBR (51.2 kbps). SPE will not be available when the LBR (1.6 kbps) is being downlinked.

54.4.2 MAGNETIC RECORDERS

The following parameters from the systems monitor will be made available through mixer No. 1 of the EMR data converter FM multiplexer to the telemetry area for recording on magnetic tape recorders. USB stations will record all available parameters as listed below. A 100-kHz reference oscillator will be put on mixer No. 1 at all stations except BDA, HAW, TEX, GDSX, HSKX, and MADX.

54.4.2.1 Split Stationsa. BDA and TEX

<u>Signal</u>	<u>IRIG Channel No.</u>
Rcvr No. 1 SPE	2
Rcvr No. 1 AGC	3
Rcvr No. 2 SPE	4
Rcvr No. 2 AGC	5
Transponder AGC (sys 1)	6
Transponder AGC (sys 2)	7
Rcvr No. 2 FM AGC	8
TR-104 rcvr AGC	9

b. HAW

<u>Signal</u>	<u>IRIG Channel No.</u>
Rcvr No. 1 SPE	2
Rcvr No. 1 AGC	3
Rcvr No. 2 SPE	4
Rcvr No. 2 AGC	5
Transponder AGC (sys 1)	6

<u>Signal</u>	<u>IRIG Channel No.</u>
Transponder AGC (sys 2)	7
Rcvr 3 AGC	8
Rcvr 3 SPE	9
Rcvr No. 3 FM AGC	10
Rcvr No. 4 FM AGC	11

c. GDSX, HSKX, MADX

<u>Signal</u>	<u>IRIG Channel No.</u>
Sys 3 transponder AGC	3
Sys 3 transponder SPE	4
Sys 3 rcvr No. 5 AGC	5
Sys 3 rcvr No. 5 SPE	6
Sys 3 rcvr No. 6 AGC	7
Sys 3 rcvr No. 6 SPE	8
Sys 4 transponder AGC	3
Sys 4 transponder SPE	4
Sys 4 rcvr No. 7 AGC	5
Sys 4 rcvr No. 7 SPE	6
Sys 4 rcvr No. 7 FM AGC	7
Sys 4 rcvr No. 8 FM AGC	8
All system 3 functions assigned to mixer 1	
All system 4 functions assigned to mixer 2	

54.4.2.2 ACN, ANG, CRO, CYI, GBM, GDS, GWM, GYM, HSK, HTV, MAD, MER, MIL, RED, and VAN

<u>Signal</u>	<u>IRIG Channel No.</u>
TR-104 rcvr AGC (ANG, CYI, and GYM only)	10
Transponder AGC (sys 1)	11
Transponder SPE (sys 1)	12
Rcvr No. 1 AGC	13
Rcvr No. 1 SPE	14
Rcvr No. 2 AGC	15
Rcvr No. 2 SPE	16
Rcvr No. 2 FM AGC (single stations only)	17
Rcvr No. 1 DPE*	17

*MIL will record these signals on launch and S-IVB second burn phases.

<u>Signal</u>	<u>IRIG Channel No.</u>
Rcvr No. 3 DPE*	18
Rcvr No. 3 AGC	9
Rcvr No. 3 SPE	8
Rcvr No. 3 FM AGC	7
Rcvr No. 4 FM AGC	6
Transponder AGC (sys 2)	5
Transponder SPE (sys 2)	4

*MIL will record these signals on launch and S-IVB second burn phases.

54.4.3 CALIBRATION POINTS

54.4.3.1 IRIG Channel Calibration Points. The USB system monitor tech will relay the calibration points to the MTR tech for voice annotation.

54.4.3.2 Transponder AGC and SPE Calibration Points. The following points will be used to calibrate the meters mounted on the RF control console. These points are based on 0- to 10-volts full scale corresponding to the PCM DAC outputs:

IU CSS, CSM and LM Transponder

<u>AGC (dbm)</u>	<u>Volts</u>	<u>SPE (kHz)</u>	<u>Volts</u>
-120			
-110		+150	
-100		+100	
-90		+50	
-80	To be supplied	0	To be supplied
-70		-50	
-60		-100	
-50		-150	
-40			

54.5 PREPASS CHECKLISTS

The following AS-506 mission controlled USB system settings will be used in conjunction with paragraph 54.4.7 of the NOD.

a. Signal Data Demodulator

(1) Single Station Patching

<u>From</u>	<u>To</u>
(a) Rcvr 1 video	Demod input video
(b) PM out	PM voice demod in
(c) Backup voice 1	Backup voice in
(d) Rcvr 2 50 MHz	Demod input 50 MHz
(e) Rcvr 2 video	Alt PM video in
(f) Alt PM out or FM out*	FM voice demod in
(g) Backup voice 2	Alt PM backup voice in
(h) Alt PM out or FM out*	FM TLM demod in

*Dependent upon whether LM downlink is PM or FM.

This patching is provided only as a guideline and is based on maximum capability of single stations to support CSM/PM (rcvr 1) and LM (rcvr 2) simultaneously. (The TR-104 rcvr will normally support CSM/FM and should not require any patching.) Patching may be changed as required for other support configurations given in the SCM, or for contingencies occurring in real time.

(2) Eighty-five-foot and Dual 30-foot Station Patching

<u>From</u>	<u>To</u>
(a) SDDS 1: Rcvr 1 video	Demod input video
PM out	PM voice demod in
Backup voice 1	Backup voice in
Rcvr 2 50 MHz*	Demod input 50 MHz
(b) SDDS 2: Rcvr 3 video*	Demod input video
PM out	PM voice demod in
Backup voice 1	Backup voice in
Rcvr 4 50 MHz	Demod input 50 MHz

*These two patches may be reversed if the LM is in the FM mode.

This patching is provided only as a guideline. Alternate patching may be used as required for other support configurations given in the SCM, or for real-time contingencies.

b. Verification Receivers

<u>Unit/Function</u>	<u>Indication/Setting</u>
Xtal selector	Remote

c. TR 104A-1 Receiver

<u>Unit/Function</u>	<u>Indication/Setting</u>
(1) RF tuner module in Y wheelhouse XTAL/VFO-AFC/VFO switch	XTAL
(2) Receiver controls (front panel)	
(a) Video output selector switch	As required
(b) Video BW 1 switch	Position 4 for all CSM/FM modes
(c) Video BW 2 switch	Position 4 for CSM/FM Modes 1, 2, 6, 7, 8, 9, 11, and 12
	Position 1 for CSM/FM Modes 3, 5, and 10
	Position 2 for CSM/FM Mode 4
(d) Second L.O. selector switch*	XTAL position
(e) RF gain switch	AGC F position

* Use VFO position and tune for center frequency IF when the XTAL position frequency is decidedly off-center.

d. Carrier Frequency Demodulator (TRW)

<u>Unit/Function</u>	LM All FM Modes	CM FM Modes <u>1,2,4,6,7,8,9,11,12</u>	CM FM Modes <u>3,5,10</u>
50-MHz IF bandwidth	Unfiltered	Wide	Narrow
Loop bandwidth	Wide	Wide	Wide

e. Carrier Frequency Demodulator (Motorola)

<u>Unit/Function</u>	<u>Switch Position</u>
Power on/off switch	ON
Loop status switch	NORMAL
Mode switch	LOCAL
Bandwidth switch	WIDE*

*Only in LM Mode 10 or CM FM Mode 4; all other FM modes will be NARROW.

Supplement to Section 55

RSDP

SUPPLEMENT TO SECTION 55. REMOTE SITE DATA PROCESSOR (RSDP)

55.1 GENERAL

55.1.1 SYSTEM TAPES DESCRIPTION

55.1.1.1 Magnetic Tapes. The Apollo RSDP stations will receive two individual systems tapes. Each tape will consist of the Command (CMD), Erasable Memory Octal Dump (EMOD), Telemetry (TLM), and Off-line Universal Command History (OUCH) programs followed by high-speed TLM formats and bilevel mask formats.

55.1.1.2 System Tape Updates. Systems tapes will be updated (errata incorporated) on station by direction of Code 822 during premission periods and by the NOM during mission periods.

55.1.1.3 Systems Tape Loading. To ensure that the format selection time requirement is met, the TLM program should, when possible, be loaded last. This practice will automatically position the system tape in the format area. In certain conditions where it is necessary to reload only the CMD program or to load the CMD program last, it is suggested that a format be selected from the tape after loading has been completed.

55.1.2 MISSION INFORMATION

Table 55-1 is an operational aid for the M&O and computer operators, depicting required RSDP support. Each station is required to maintain their own table in accordance with briefing messages transmitted prior to scheduled test. An effort is being made to ensure that all briefing message originators transmit required information in the same format as used in table 55-1.

55.1.3 PLIMS - TTY PLIMS NOT REQUIRED FOR AS-506, NCG-725 (PLIM DATA SHEETS WILL BE INCLUDED IN THE DATA SHIPMENT) PDC #39

55.2 TELEMETRY REQUIREMENTS

55.2.1 HIGH-SPEED TLM FORMAT REQUIREMENTS

Each station will configure their TLM program to output the following formats:

	<u>Prime</u>	<u>Backup</u> * PDC # 1
a. <u>Launch to Insertion</u>		
MIL, BDA, ANG	3/8	2
VAN, GBM	13/8	2
ALDS	1	1
b. <u>Earth Orbit</u>		
All stations	13/8	2
c. <u>TLI Cutoff to S-IVB/IU LOS</u>		
Stations tracking CSM	7/9	8
Selected Stations (to be provided) TIC IN REAL TIME	8/13	2
d. <u>TLC after S-IVB/IU LOS First Occultation</u>		
All stations	7/9	8

* THE "BACKUP" FORMAT IS THE TELEMETRY FORMAT TO BE USED IN THE EVENT THAT ONLY ONE HIGH SPEED DATA LINE IS AVAILABLE FROM A STATION AND NOT THE FORMAT TO BE STORED IN PRESELECT.

STF NEW
PAGE

SUPPLEMENT TO SECTION 55. REMOTE SITE DATA PROCESSOR (RSDP)

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55.1.1 SYSTEM TAPES DESCRIPTION

55.1.1.1 Magnetic Tapes. The Apollo RSDP stations will receive two individual systems tapes. Each tape will consist of the Command (CMD), Erasable Memory Octal Dump (EMOD), Telemetry (TLM), and Off-line Universal Command History (OUCH) programs followed by high-speed TLM formats and bilevel mask formats.

55.1.1.2 System Tape Updates. Systems tapes will be updated (errata incorporated) on station by direction of Code 822 during premission periods and by the NOM during mission periods.

55.1.1.3 Systems Tape Loading. To ensure that the format selection time requirement is met, the TLM program should, when possible, be loaded last. This practice will automatically position the system tape in the format area. In certain conditions where it is necessary to reload only the CMD program or to load the CMD program last, it is suggested that a format be selected from the tape after loading has been completed.

55.1.2 MISSION INFORMATION

Table 55-1 is an operational aid for the M&O and computer operators, depicting required RSDP support. Each station is required to maintain their own table in accordance with briefing messages transmitted prior to scheduled test. An effort is being made to ensure that all briefing message originators transmit required information in the same format as used in table 55-1.

55.2 TELEMETRY REQUIREMENTS

55.2.1 HIGH-SPEED TLM FORMAT REQUIREMENTS

Each station will configure their TLM program to output the following formats:

	<u>Prime</u>	<u>Backup</u> * PDC # 1
a. <u>Launch to Insertion</u>		
MIL, BDA, ANG	3/8	2
VAN, GBM	13/8	2
ALDS	1	1
b. <u>Earth Orbit</u>		
All stations	13/8	2
c. <u>TLI Cutoff to S-IVB/IU LOS</u>		
Stations tracking CSM	7/9	8
Selected Stations (to be provided) TIC IN REAL TIME)	8/13	2
d. <u>TLC after S-IVB/IU LOS First Occultation</u>		
All stations	7/9	8

* THE "BACKUP" FORMAT IS THE TELEMETRY FORMAT TO BE USED IN THE EVENT THAT ONLY ONE HIGH SPEED DATA LINE IS AVAILABLE FROM A STATION AND NOT THE FORMAT TO BE STORED IN PRESELECT.

Table 55-1. Briefing Information

Supporting Test	Plugs-In	Plugs-Out	LV Sit	CSM Sit	LM Sit	FRT	CDDT-Wet	CDDT-Dry	GSFC Sim	Net-Sim (Short)	Net-Sim (Long)	Launch
<u>Program</u>												
<u>Systems Tape</u>												
TLM Errata	T	T	T	T	T	T	T	T	T	T	T	T
CMD Errata	C	C	C	C	C	C	C	C	C	C	C	C
EMOD Errata	E	E	E	E	E	E	E	E	E	E	E	E
OUCH Errata	O	O	O	O	O	O	O	O	O	O	O	O
ALSEP Errata	A	A	A	A	A	A	A	A	A	A	A	A
Ship Special												
<u>Initialization</u>												
NCG No.												725
Mis No.	1	1	1	1	1	1	1	1	1	1	1	1
Sta ID												OWN
Lot -(69,07)												
<u>Other</u>												
Map Wait Period												C
Sub-bit Code												3
Retrans												3,8
TLM FMTS												
Loads (MSG DTG)												

	<u>Prime</u>	<u>Backup</u>
e. <u>Lunar Orbit-LM Not Active</u>		
All stations	7/9	8
During landmark tracking	14 7/9	
PDC # 1 Selected Stations (to be ^{CHANGED} provided BY TIC IN REAL TIME)		
f. <u>Lunar Orbit - CSM and LM Active Until LM LOS</u>		
One station coverage	5/ 14 15	6 PDC # 1
Two station coverage	5/ 14 15	6
	7/9	8
g. <u>TEC After LM LOS</u>		
All stations	7 and 9	8
h. <u>Reentry</u>		
All stations	7 and 9	8

55.2.2 ILLEGAL FORMAT COMBINATIONS

The AS-506 TLM program maintains two active high-speed TLM formats in core. Figure 55-1 contains all legal (blank) and illegal (X) format combinations. For AS-506 the TLM program will initialize with format 003 on line A, format 008 on line B, and format 013 in preselect.

55.2.3 TELEMETRY OPERATIONAL PROGRAM

The TLM program will compress and reformat TLM data for 1.2- or 2.4-kbps transmission to MCC. The following TLM data formats will be selected by the Telemetry Instrumentation Controller (TIC) or on station via the M&O TLM Computer Address Matrix (CAM).

<u>CAM</u>	<u>Format</u>	<u>Vehicle Data</u>	
X02	02	CSM, CMC, S-IVB, IU, S-II	
X03	03	IU, S-IVB, S-II	
X04	04	LM, LGC, ^{AGS} AGC , EVCS	PDC # 1
X05	05	LM, CSM, EVCS	
X06	06	CMC, LGC, CSM, AGS, LM, EVCS	
X07	07	CMC, LGC, AGS	
X08	08	CMC, CSM	
X09	09	CSM	
X10	10	CSM, CMC	
X11	11	CMC, AGS, LGC	

Page 1

Page 2

1. The first part of the Act is

All stations
The first part of the Act is
The first part of the Act is

2. The second part of the Act is

The second part of the Act is
The second part of the Act is

3. The third part of the Act is

The third part of the Act is

The third part of the Act is

The third part of the Act is

4. The fourth part of the Act is

The fourth part of the Act is
The fourth part of the Act is
The fourth part of the Act is

5. The fifth part of the Act is

The fifth part of the Act is
The fifth part of the Act is
The fifth part of the Act is

Item	Amount	Total
1. The first part of the Act is	100	100
2. The second part of the Act is	200	300
3. The third part of the Act is	300	600
4. The fourth part of the Act is	400	1000
5. The fifth part of the Act is	500	1500
6. The sixth part of the Act is	600	2100
7. The seventh part of the Act is	700	2800
8. The eighth part of the Act is	800	3600
9. The ninth part of the Act is	900	4500
10. The tenth part of the Act is	1000	5500

<u>CAM</u>	<u>Format</u>	<u>Vehicle Data</u>
N/A	12*	LGC, or CMC EMOD
X13	13	IU, S-IVB
X14	14	CSM, CMC
X15	15	CMC, AGS, LGC
X22	22	LM, CSM, EVCS (PAM 1 Contg)
X23	23	LM, CSM, EVCS (PAM 2 Contg)
X24	24	LM, CSM, EVCS (PAM 3 Contg)
X25	25	LM, CSM, EVCS (PAM 4 Contg)
N/A	50	CAPS

*Only when the EMOD program is residing in core.

where: X = 0 LM live/CSM live

1 LM live/CSM dump

2 LM dump/CSM live

3 LM dump/CSM dump

CANCELLED BY PDC 55

(SEE P. 55-27)
P57.6.3.5

~~55.2.3.1 PAM/640B INTERFACE. THE COMPUTER OPERATOR WILL POSITION THE "PAM 1" AND "PAM 2" 1299 SWITCHES TO NEUTRAL (PAM INHIBITED). ONCE THE PAM STATION IS IN SOLID LOCK, TLM WILL CUE THE COMPUTER OPERATOR TO ENABLE THE PAM 1299 TO THE TELEMETRY PROGRAM.~~

PDC
33

55.2.3.1 TIME CODE TRANSLATOR/640B INTERFACE. WHEN THE TIME CODE TRANSLATOR IS POWERED DOWN THE COMPUTER OPERATOR WILL POSITION THE "GMT TAPE PLAYBACK" 1299 SWITCH TO NEUTRAL.

PDC #55

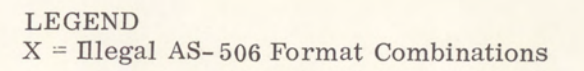


Figure 55-1. Legal/Illegal Format Combinations

<u>CAM</u>	<u>Format</u>	<u>Vehicle Data</u>
N/A	12*	LGC, or CMC EMOD
X13	13	IU, S-IVB
X14	14	CSM, CMC
X15	15	CMC, AGS, LGC
X22	22	LM, CSM, EVCS (PAM 1 Contg)
X23	23	LM, CSM, EVCS (PAM 2 Contg)
X24	24	LM, CSM, EVCS (PAM 3 Contg)
X25	25	LM, CSM, EVCS (PAM 4 Contg)
N/A	50	CAPS

*Only when the EMOD program is residing in core.

where: X = 0 LM live/CSM live

1 LM live/CSM dump

2 LM dump/CSM live

3 LM dump/CSM dump

SPT
NRW
PAGE

55.3 TELEMETRY CAM FUNCTIONS

55.3.1 HIGH-SPEED FORMAT INTERROGATION

By performing the following, it is possible to determine which of two high-speed formats are outputting data (active) and which telemetry format is within the preselect area (non-active):

- a. Press the CLEAR PBI.
- b. Press the RETRIEVE HSTL FORMAT PBI.
- c. Press 777 and the INITIATE PBI.
- d. The high-speed printer will printout:

TLM HSD FMT FFF READY

OUTPUT: A-AAA B-BBB

PRE-SEL: CCC

55.3.2 CHANGING HIGH-SPEED TLM FORMATS

The high-speed TLM formats are changed by retrieving the format desired from magnetic tape and replacing the presently active format with the new format.

- a. To retrieve high-speed formats:
 - (1) Press the CLEAR PBI.
 - (2) Press the RETRIEVE HSTL FORMAT PBI.
 - (3) On the numerical keyboard, press the three PBIs corresponding to a three-digit number combination derived from the following:

- (a) The first digit reflects the type of data to be output where:

0 = LM live/CSM live
1 = LM live/CSM dump
2 = LM dump/CSM live
3 = LM dump/CSM dump

Note

Dump refers either to dump or tape playback, or to dump tape playback data (in effect to any recorded data). Whenever a dump format is selected, the associated HSD output vehicle status word (bit 2³) is set to 1 prior to the program accepting any PCM data. For example, if format 1XX is selected, the CSM (word 11) and CMC (word 12) bit 2³ is set.

- (b) The last two digits correspond to the TLM format number requested; i.e., format 10 would be selected by pressing PBIs 1 and 0.
 - (4) Press the INITIATE PBI.

- (5) The high-speed TLM format will be retrieved from magnetic tape and placed in a preselected core area. The high-speed printer will printout:

TLM HSD FMT FFF READY

OUTPUT: A-AAA B-BBB

PRE-SEL: FFF

- (6) If the requested format has already been preselected or is currently being output on another DTU line, the following will be printed out:

TLM HSD FMT EEE NOW IN CORE

OUTPUT: A-AAA B-BBB

PRE-SEL: CCC

b. To replace high-speed formats:

- (1) Press the CLEAR PBI.
- (2) Press the REPLACE HSTL FORMAT PBI.
- (3) On the numerical keyboard, press the three PBIs corresponding to the three-digit number combination (001 to 399) representing the active TLM format to be replaced.
- (4) If the format requested is not presently active, the following will be printed out:

HSD FMT DDD ILL RQ

- (5) Legal and illegal TLM format combinations are tabulated in figure 55-1. If the program decides the request would make simultaneous HSD formats illegal, the following will be printed out:

TLM HSD ILL COMB DDD AND DDD

OUTPUT: A-AAA B-BBB

PRE-SEL: CCC

- (6) Under normal conditions, the high-speed TLM format will be replaced and the high-speed printer will print out:

TLM HSD FMT CHANGE AAA

OUTPUT: A-AAA B-BBB

PRE-SEL: CCC

55.3.3 TLM START/STOP

The high-speed TLM may be started or stopped to MCC, GSFC, or to BOTH, by unique CAM entries. The start/stop functions are easily explained; however, due to the numerous combinations in determining the destination of the data, CAM entries will not be explained in detail. The M&O can determine the destination of TLM data when a start/stop function is selected by using figure 55-2 in conjunction with his present station configuration.

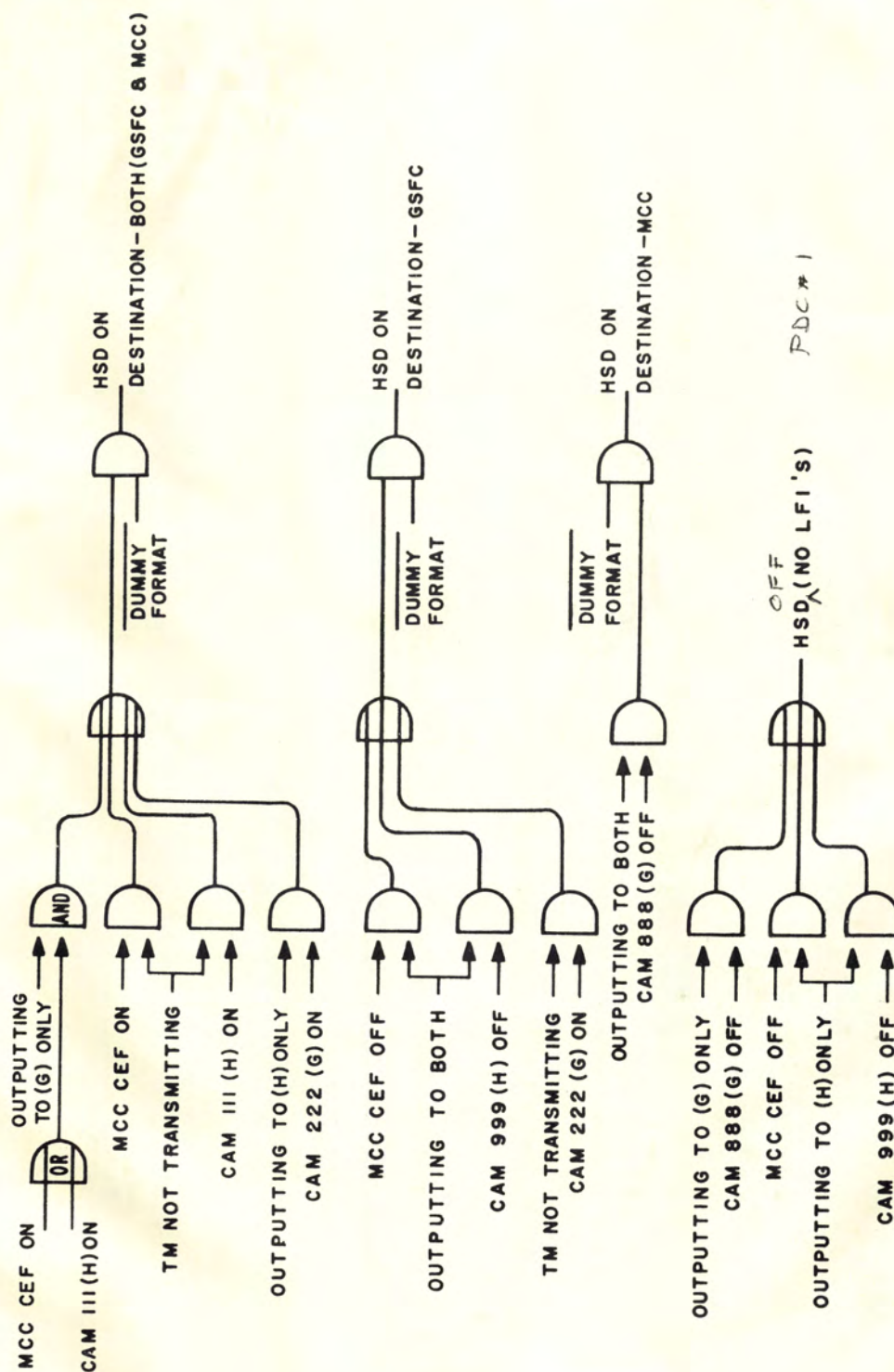


Figure 55-2. HS Telemetry On/Off Requests

a. Start TLM to MCC, GSFC, or BOTH

- (1) Press the CLEAR PBI.
- (2) Press the HSTL START/STOP PBI.
- (3) Press 111 (MCC-H/BOTH) or 222 (GSFC) and then press the INITIATE pushbutton.
- (4) The high-speed printer will printout:
 TLM HSD ON-CAM
 TLM HSD DES-MCC-H
 or
 TLM HSD ON-CAM
 TLM HSD DES-GSFC
 or
 TLM HSD ON-CAM
 TLM HSD DES-BOTH

- (5) The program will transmit high-speed TLM or fill data.

b. Stop TLM to MCC, GSFC, or BOTH

- (1) Press the CLEAR PBI.
- (2) Press the HSTL START/STOP PBI.
- (3) Press 999 (MCC-H) or 888 (GSFC), and then press the INITIATE pushbutton.
- (4) The high-speed printer will print out:

TLM HSD OFF -CAM

- (5) Depending upon which TLM functions were already active, the following may be printed out:

TLM HSD DES - (MCC-H or GSFC)

55.4 TLM AND EMOD PROGRAM OPERATIONAL AIDS

55.4.1 HIGH-SPEED PRINTER AND 1232 TYPEWRITER SYMBOLS

To interpret 1232 computer console and high-speed printouts, the following symbols are used extensively throughout the TLM portion of this section:

- A = EMOD pass (1-4)
- B = Mission/test bit, where (M=mission and T=test)
- C = EMOD bank (1-8)
- D = Destination code where H = Houston, G = GSFC, and B = BOTH
- AA = Format number on systems tape
- AAA = High-speed format - active
- AAAAAA = Address
- BBB = High-speed format - active
- CC = IT = input terminated or a blank
- CCC = High-speed format - preselect
- DDD = High-speed format
- EEE = High-speed format AAA, BBB, or CCC
- EEEE = PCM stream (CSM, LM, S-IVB, SII, or IU)

EEE:EE:EE = Vehicle hours, minutes, seconds

FFF = High-speed format requested for retrieval

H = A-channel No. 15; B-channel No. 12

HH = Input word number of manual I/O entry that is in error

HHH = Word number in high-speed output buffer (1-300)

II = Frame No. (1 through 10)

KK = A count of the 1232 message requests which were lost while the 1232 message request stack was in an overflow state

KKKK = BOTH, GSFC, or MCCH

NN = Number of bad format records on system tape (01-10)

NNN = NCG number (0-999)

RRR = Bit rate (HBR, LBR, HLBR, INV, or blank for SLV)

SS = RT (Real Time) or TP (Tape Playback)

VVV = CTE, MET, CMC, LGC, or AGS time tags

W = L = live, D = dump or blank for SLV data

X = Mission No. 1 or 2

XX = Station ID

XXX = Three-digit CAM number

XXXX = Error detected during IC transfer:

PDC # 1 { ~~OVFL~~ (overflow) CKSM (CHECKSUM - LAST WORD TRANSFERRED)
~~PRTY~~ (parity) PTY (ODD PARITY)
 TYPE (CAP/CEF/LOT "TYPE" NOT DETECTED) ?

XX:XX:XX:XX = Vehicle day, hours, minutes, seconds; or GMT day of the month, hours, minutes, seconds

XXX:XX:XX = GET output prior to each printout in hours, minutes, and seconds

XXX:XX:XX:XX = GMT day, hour, minutes, seconds

Y = EMU channel number 0, 1, 2, or 3

ZZZ = CAP's, CEF, LOT

ZZZZZ = Status data received from MTU's (bits 0-14)

55.4.2 TELEMETRY OPERATIONAL PROGRAM HIGH-SPEED PRINTER MESSAGES

All messages on the high-speed printer are preceded by a GMT and GET time tag and the characters "TLM". The underlined variable symbols have been defined previously.

Item No.	HSP Message	Explanation
1	DTU CH <u>H</u> OUT OF SYNC- <u>AAA</u>	Output as a result of a 2 second "clock trap" monitor of DTU sensing an out-of-sync condition
2	DTU CH <u>H</u> IN SYNC- <u>AAA</u>	Output as a result of the 2 second "clock trap" monitor of DTU sensing two sequential high-speed data output frame transmissions following an out-of-sync condition

Item No.	HSP Message	Explanation
3	HSD ON-CAP	Output as a result of a CAP word being received from the command program via intercomputer channel, causing the HSD to transmit three frames of data. This message is output only when high-speed telemetry is off
4	HSD ON-CAM	Output as a result of a CAM 111 (MCC) or CAM 222 (GSFC) request, causing HSD transmission to start
5	HSD ON-CEF	Output as a result of a valid computer execute function being received from MCC or GSFC, causing HSD transmission to start
6	HSD OFF - CAP SENT	Printed out after three CAPS have been transmitted if: the TLM program has not been transmitting telemetry or if the program receives a CEF from MCC commanding TLM off
7	HSD OFF - CAM	Output after HSD transmission has been terminated by a CAM 999 (MCC) or 888 (GSFC) request
8	HSD OFF - LOS	Output after HSD transmission has been terminated by the 1232 type-in LOS T, indicating complete loss of all input streams. This message is also output if LOS T has been previously inserted and a CAP has completed transmission.
9	NCG <u>NNN</u>	Output after initiation indicating the network control group number inserted by the operator during initiation
10	MIS <u>X</u>	Output after initiation indicating the mission number inserted by the operator during initiation
11	STA <u>XX</u>	Output after initiation indicating the station number inserted by operator
12	GMT YR MO DA HR	Output after initiation indicating the GMT inserted by the operator during initiation
13	DES <u>D</u>	Output after initiation indicating where the HSD is destined, initially under program control - modified by start/stop telemetry requests

Item No.	HSP Message	Explanation
14	SLV PRIME I	Output after initiation to indicate that the IU stream is prime input for all S-IVB/IU parameters; S-IVB can be made prime by use of manual I/O routine COS
15	SLV PRIME S	Output after initiation if S-IVB has previously been selected by manual I/O; this message indicates that the S-IVB stream is the prime input for all S-IVB/IU parameters. IU can be made prime by use of manual I/O routine COS.
16	MTB <u>B</u>	Output after initiation or after MTB manual I/O routine, indicating status of mission/test bit in high-speed output word seven
17	ALL FORMATS ON ALL ITERATIONS - GOOD	Output after initiation indicating status of HSD formats on systems tape
18	FORMAT <u>AA</u> - <u>NN</u> BAD RECS	Output after initiation indicating the number of bad format records on the systems magnetic tape
19	BI-LEVEL MASKS <u>NN</u> BAD REC	Output after initiation indicating the number of bad bi-level mask records in the format area of the systems tape
20	LOT, YR, MO, DA, HR, MN, SC (UPDATED-SITE)	Output during initiation indicating that the current Liftoff Time (LOT) was updated via the 1232 I/O console at the remoted site
21	LOT, YR, MO, DA, HR, MN, SC (UPDATED-MCCH)	Output during initiation indicating that the current LOT was updated via HSD and intercomputer from MCC
22	LOT YR, MO, DA, HR, MN, SC	Output during initiation or upon receipt of a new LOT received by HSD or after operator has used manual I/O routine, indicating that the current LOT is the original liftoff time entered during initiation
23	IC ENABLE	Output when intercomputer communications to the command program has been re-established after an IC disable

Item No.	HSP Message	Explanation
24	IC DISABLE	Output when intercomputer communication has been lost with the command computer
25	IC <u>ZZZ</u> XMIT FAIL	Output when the TLM program attempts to transmit data to command via the intercomputer channel and fails
26	IC RCVE ERR <u>XXXX</u>	Output when an IC transmission received by the telemetry program has one of two ^{THREE} particular errors
27	IC RCVE OVFL <u>ZZZ</u>	Output to indicate that an IC transmission received by the telemetry computer has caused an overflow of the IC stacking table
28	USB STATUS FAILURE	Initial output if USB status word is not input from the ISA within 10 seconds or 10 seconds has elapsed since receiving the last USB status
29	USB STATUS ENABLE	Output immediately following initialization phases or when the program has detected the presence of an external interrupt after failure has occurred
30	(TP) GMT INPUT ESTABLISHED	Output when GMT or Tape Playback (TP) GMT is initially input to the telemetry program
31	NO (TP) GMT INPUT	Output by GMT subprogram indicating there has been no initial input of GMT or TP GMT
32	(TP) GMT INPUT FAILURE	Output as a result of the loss of an external interrupt. The GMT or TP GMT subprogram then computes GMT and periodically checks for the presence of an external interrupt
33	(TP) GMT INPUT REESTABLISHED	Output when GMT or TP GMT subprogram detects the presence of an external interrupt (after failure has re-established the EI as the source of input), and stops computing GMT
34	HSD OFF - CEF	Output as the result of a valid computer execute function being received from MCC or GSFC causing HSD transmission to terminate

PDC # 4

Item No.	HSP Message	Explanation
35	HSD FMT <u>DDD</u> ILL RQ	Output when the retrieve HSD format number is illegal, or if the replace format is not in core
36	HSD FMT <u>EEE</u> NOW IN CORE OUTPUT: A- <u>AAA</u> B- <u>BBB</u> PRE-SEL: <u>CCC</u>	Output when an HSD format is currently in core at time of a retrieve request
37	HSD FMT CHANGE <u>AAA</u> OUTPUT: A- <u>AAA</u> B- <u>BBB</u> PRE-SEL: <u>CCC</u>	Output when the requested format change is completed
38	HSD FMT <u>FFF</u> READY OUTPUT: A- <u>AAA</u> B- <u>BBB</u> PRE-SEL: <u>CCC</u>	Output after a retrieve request indicating that the new format (which will replace the old format) is now in preselect table and ready for replace request
39	HSD ILL COMB <u>DDD</u> AND <u>DDD</u> OUTPUT: A- <u>AAA</u> B- <u>BBB</u> PRE-SEL: <u>CCC</u>	Output after replace request indicating that the requested format would form an illegal combination with the other format now being output
40	HSD DES <u>KKKK</u>	Output to indicate the current destination of high-speed telemetry destination is modified by CAM start/stop or CEF functions
41	HSD DES BOTH-CAP	Output only when the following three conditions are met: DES = GSFC, NCG \neq 999, and a CAP is transmitted
42	HSD FMT 989 ILL RQ	Output if high-speed telemetry is off and a request to terminate high-speed telemetry is input
43	ILL DES REQ-NCG 999	Printed out when the TLM program has been initialized with NCG 999 and a request has been received to transmit telemetry data to MCC
44	FM/FM LOCK	Printed when the TLM program receives valid AMQ data
45	FM/FM DISABLE	Printed when the TLM program recognizes an invalid input from the AMQ
46	COS I	Output when COS I is input on the 1232 I/O console, indicating the TLM program is now utilizing IU as the input source for all S-IVB/IU parameters

Item No.	HSP Message	Explanation
47	COS 4	Output when COS 4 is input on the 1232 I/O console, indicating the TLM program is now utilizing S-IVB as the input source for all S-IVB/IU parameters
48	LOS * E	Output when the computer operator has flagged vehicle or station loss of signal within the program by use of the LOS manual I/O routine *where: 2 = SII where: E = L (Live) 4 = SIVB = D (Dump) I = IU = B (Both) C = CSM L = LM T = Total loss
49	ROS * E	Output when the computer operator has flagged a Return Of Signal (ROS) for an individual vehicle or the station. If ROS T has been entered, a TLM parameter listing is output on the HSP and 1232.
50	ILG CAM REQ <u>XXX</u>	Output when the M&O has made a CAM operator error
51	HSD ERR FMT <u>AAA</u> FR <u>II</u> WD <u>HHH</u>	Output when bits 2 ¹³ and 2 ⁸ of the output buffer are forced to 0. If the word in error is 1 thru 20 or 300, the error is probably the result of the program. If the word error is 21 thru 299, there may be erroneous inputs being sent by the PCM.
52	HSD FMTS <u>AAA</u> <u>BBB</u> OUTPUT: <u>CCC</u> PRESELECTED	Output after initiation; it indicates that the HSD formats selected for output and the format are residing in core as standby
53	SCH HIT GMT XXX:XX:XX:XX for VVV, XX:XX:XX:XX	This message is output if the vehicle time is greater than or equal to search time
54	PCM LOCK CHL <u>Y</u> , <u>EEEE</u> , <u>W</u> , <u>RRR</u> , <u>SS</u> , <u>CC</u>	Output 10 seconds after receiving or dropping lock, indicating the 642B channel number, vehicle, data type, and status of data input to the computer
55	CAM HARDWARE MALFUNCTION	Output whenever the computer decodes a CAM momentary as a BCD other than 0 through 9.

*Refer to explanation column, item No. 48.

CC-17
(INPUT TERMINATED)
OR A BLANK

55.4.3 EMOD HIGH-SPEED PRINTER STATUS MESSAGES

Item No.	HSP Message	Explanation
1	<u>A</u> <u>C</u> NOT VALID LOS OF SYNC	Program received an abnormal interrupt from decom during bank "C" input processing
2	<u>A</u> <u>C</u> NOT VALID BAD PARITY WD 2	Printed when an invalid parity is detected in EMOD word 2A of bank "C"
3	<u>A</u> <u>C</u> NOT VALID DUPLICATION WD 2 OF BANK X	Printed out when it is determined that the bank No. or pass No. decoded from EMOD word 2A has already been received during that EMOD dump. If "C" and "X" are the same number, a pass number was received that had already been dumped. If "X" differs from "C", the "X" bank number has already been received.
4	<u>A</u> <u>C</u> NOT VALID BAD WOC XXX	Generated whenever an incorrect EMOD word order code is detected in any EMOD word. XXX represents the downlist word number 001 through 130.
5	<u>A</u> <u>C</u> NOT VALID BAD ID REG	Indicates that EMOD word 1A had an invalid parity or that an invalid CMC ID was detected when the spacecraft downlink returned to the CMC downlist after transmission of the last bank. If an EMOD word 1A parity error was detected the program will also print "BAD ID REG" for the previous bank (if any).
6	<u>A</u> <u>C</u> NOT VALID BAD SYNC REG	Indicates that invalid parity was detected in EMOD word 1B or that the EMOD 1B word contents did not contain 77340. In either case the same printout is generated for the previous bank (if any).
7	<u>A</u> <u>C</u> NOT VALID TOO FEW WORDS	Indicates that less than 130 EMOD words were received between the start of consecutive banks
8	<u>A</u> <u>C</u> NOT VALID TOO MANY WORDS	Indicates that more than 130 EMOD words were received between the start of consecutive banks

Item No.	HSP Message	Explanation
9	A C NOT VALID WRONG PASS NO. X WD 2	Indicates that the pass or bank number received was greater than expected. If "A" is the same as "X", the bank number received for that bank was greater than expected. If "A" is not the same as "X", a pass number was received in that bank that was greater than expected.
10	A ALL BANKS VALID	Indicates that all banks of the pass as defined in "A" were received and validated. (See item 11 for definition of a valid bank.)
11	<u>A</u> <u>C</u> VALID	A valid printout indicates that no loss of sync was detected between word 1A of bank "C" and word 2A of bank "C" plus 1. It also indicates that the sync register was valid for banks "C" and "C" plus 1, and that the correct bank and pass number were received for bank "C".
12	<u>A</u> <u>C</u> NOT TRANSMITTED	Indicates no banks of the pass specified in "A" were processed by program. It is assumed that no data was sent.
13	A C NOT VALID NOT RECEIVED	Indicates no data was received for the bank specified by "C". If no banks of a pass were received, the item 12 printout would be generated.
14	HSD ON	The program is starting the DTU processing
15	HSD OFF	All data has been transmitted by the DTU
16	ILLEGAL CAM REQUEST	The CAM input was not valid
17	ILLEGAL CAM REQUEST DATA PROCESSOR	The valid CAM input was received while inputting or outputting data

55.5 COMMAND REQUIREMENTS

55.5.1 GENERAL

The SLV, LM, and CSM vehicles will be commanded exclusively via USB. UHF commanding is still available within the CMD-operational program, but is not required for mission support other than for range safety at BDA.

55.5.2 STATION STATUS CAP WORD

The site status CAP word is shown in table 55-2.

Table 55-2. Station Status CAP Word

Bit		Indication
Position	Setting	
1 thru 4	0101	CAP ID
5	0	Spare
6	1 0	Load enable Load disable
7	1 0	Mode II Mode I
8	1 0	SCO No. 2 OK SCO No. 2 Not OK
10	1 0	UHF transmitter No. 2 on UHF transmitter No. 2 off
11	1 0	UHF transmitter No. 1 on UHF transmitter No. 1 off
12	1 0	RF power on RF power off
13	1 0	UHF transmitter No. 1 prime UHF transmitter No. 2 prime
14	1 0	UHF carrier tested USB carrier tested
15	1 0	RF return data good RF return data bad
16	1 0	USB transmitter No. 2 on USB transmitter No. 2 off

Table 55-2. Station Status CAP Word (cont)

Bit		Indication
Position	Setting	
17	1 0	USB transmitter No. 1 on USB transmitter No. 1 off
18	1 0	CSM tested (verification revr No. 1) LM/SLV tested (verification revr No. 2)
19	0	Spare
20 thru 24	XXXXXX	Site ID
25	0	Spare
26	X	Mission ID
27 thru 40	XXXXXXXX XXXXXXXX	Polynomial error protection.

55.5.3 REAL-TIME COMMANDS

55.5.3.1 SLV RTCs

PDC # 1	CAM No.	CMDH / Printout	Uplink Octal				Rev Data	Command Description
	002	SEQ 1 INH	753	513	137	556	602	Sequence No. 1 Inhibit
	004	SEQ 2 INH	753	513	237	356	604	Sequence No. 2 Inhibit
	006	SEQ 3 INH	753	513	337	156	606	Sequence No. 3 Inhibit
	010	SEQ 4 INH	753	513	436	756	610	Sequence No. 4 Inhibit
	012	SEQ 5 INH	753	513	536	556	612	Sequence No. 5 Inhibit
	022	DELETE NAV	753	533	135	556	622	Delete Navigation Update
	036	SLINGSHOT	753	533	734	156	636	Sling Seq Enable
	040	TERMINATE	753	553	027	756	640	Terminate
	042	EX LST CMD	753	553	127	556	642	Execute Last Command
	046	ALT TB 4	753	553	327	156	646	Alternate Time Base 4
	050	ALT SEQ 6	753	553	426	756	650	Alternate Sequence 6
	052	ALT SEQ 1	753	553	526	556	652	Alternate Sequence 1
	054	ALT SEQ 2	753	553	626	356	654	Alternate Sequence 2
	056	ALT SEQ 3	753	553	726	156	656	Alternate Sequence 3
	060	ALT SEQ 4	753	573	025	756	660	Alternate Sequence 4
	066	EXEC MAN A	753	573	325	156	666	Execute Maneuver
	070	EXEC MAN B	753	573	424	756	670	Execute Maneuver
	072	EXEC MAN C	753	573	524	556	672	Execute Maneuver
	074	RSM TM SEQ	753	573	624	356	674	Resume Time Sequence
	076	SEQ 6 INH	753	573	724	156	676	Sequence 6 Inhibit
	100	SEQ 7 INH	757	513	017	756	700	Sequence 7 Inhibit
	102	SEQ 8 INH	757	513	117	556	702	Sequence 8 Inhibit
	112	ALT SEQ 5	757	513	516	556	712	Alternate Sequence 5
	114	SET RL FLG	757	513	616	356	714	Set Roll Flag
	116	TM SEL A	757	513	716	156	716	Time Select - Group A
	120	TM SEL B	757	533	015	756	720	Time Select - Group B
	122	TM SEL C	757	533	115	556	722	Time Select - Group C
PDC # 1	124	SPARE 21 S	757	533	215	356	724	Spare
	126	SET ANT OM	757	533	315	156	726	Antenna Set on Omni
	130	SET ANT LG	757	533	414	756	730	Antenna Set Low Gain

<u>PDC #1</u>	<u>CAM No.</u>	<u>CMDH/REVIEW Printout</u>	<u>Uplink Octal</u>				<u>Rev Data</u>	<u>Command Description</u>
	132	SET ANT HG	757	533	514	556	732	Antenna Set High Gain
	134	RSTRT ENBL	757	533	614	356	734	Restart Enable
	136	RL FLG RST	757	533	714	156	736	Roll Flag Reset
	140	TB6 INHIB	757	553	007	756	740	TB6 Inhibit
	142	SPARE 23S	757	553	107	556	742	Spare
	144	SPARE 24S	757	553	207	356	744	Spare
	146	SPARE 25S	757	553	307	156	746	Spare
	150	SPARE 26S	757	553	406	756	750	Spare
	152	SPARE 27S	757	553	506	556	752	Spare
	154	SPARE 28S	757	553	606	356	754	Spare
	156	SPARE 29S	757	553	706	156	756	Spare
	160	SPARE 30S	757	573	005	756	760	Spare
	162	SPARE 31S	757	573	105	556	762	Spare
	164	SPARE 32S	757	573	205	356	764	Spare
	166	SPARE 33S	757	573	305	156	766	Spare
	170	SPARE 34S	757	573	404	756	770	Spare
	172	SPARE 35S	757	573	504	556	772	Spare
	174	SPARE 36S	757	573	604	356	774	Spare
	176	SPARE 37S	757	573	704	156	776	Spare
	241	LH2 VNT OP	753	533	235	356	624	LH2 Vent Open
			753	053	167	456	043	
			757	013	217	356	104	
	242	LH2 VNT CL	753	533	235	356	624	LH2 Vent Closed
			753	053	267	256	045	
			753	033	434	756	030	

PDC # 1

<u>CAM No.</u>	<u>CMDH/REVIEW Printout</u>	<u>Uplink Octal</u>				<u>Rev Data</u>	<u>Command Description</u>
244	LOX PR SFE	753	533	235	356	624	LOX Pressure Safe
		753	053	267	256	045	
		753	073	025	756	060	
		753	533	235	356	624	
		753	053	367	056	047	
		753	053	426	756	050	
245	LOXNPVOPON	753	533	235	356	624	LOX NPV Valve
		753	053	267	256	045	Open On
		753	073	025	756	060	
246	LOXNPVOPOF	753	533	235	356	624	LOX NPV Valve
		753	053	367	056	047	Open Off
		757	033	215	356	124	
247	S4B CUTOFF	753	533	235	356	624	S-IVB Cutoff
		753	053	267	256	045	
		753	073	225	356	064	
248	CMD SYS EN	753	533	235	356	624	Command System
		757	013	057	656	101	Enable
		757	033	414	756	130	
260	SEC DP NAV	753	533	335	156	676	Sector Dump for NAV
		757	013	357	056	107	Update
		753	073	524	556	072	
261	SEC DP PTU	753	533	335	156	626	Sector Dump for PTU
		757	013	057	656	101	
		753	053	127	556	042	
262	SEC DP OTU	753	533	335	156	626	Sector Dump for OTU
		757	013	357	056	107	
		753	033	434	756	030	
301	SG WD DP 1	753	533	434	756	630	Single Word Dump
		753	053	466	656	051	Sequence 1
		753	013	037	756	000	
		753	073	065	656	061	
302	SG WD DP 2	753	533	434	756	630	Single Word Dump
		753	053	466	656	051	Sequence 2
		753	013	237	356	004	
		753	073	065	656	061	
303	SG WD DP 3	753	533	434	756	630	Single Word Dump
		753	053	466	656	051	Sequence 3
		753	013	436	756	010	
		753	073	065	656	061	

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CAM No.	PDC # 1 CMDH/REVIEW Printout	Uplink Octal				Rev Data	Command Description
304	SG WD DP 4	753	533	434	756	630	Single Word Dump Sequence 4
		753	053	466	656	051	
		753	013	636	356	014	
		753	073	065	656	061	
305	SG WD DP 5	753	533	434	756	630	Single Word Dump 5
		753	053	466	656	051	
		753	033	035	756	020	
		753	073	065	656	061	
306	SG WD DP 6	753	533	434	756	630	Single Word Dump 6
		753	053	466	656	051	
		753	033	235	356	024	
		753	073	065	656	061	
307	SG WD DP 7	753	533	434	756	630	Single Word Dump 7
		753	053	466	656	051	
		753	033	434	756	030	
		753	073	065	656	061	
308	SG WD DP 8	753	533	434	756	630	Single Word Dump 8
		753	053	466	656	051	
		753	033	634	356	034	
		753	073	065	656	061	
309	SG WD DP 9	753	533	434	756	630	Single Word Dump 9
		753	053	466	656	051	
		753	053	027	756	040	
		753	073	065	656	061	
PDC # 1 381	SPARE 1 S	753	513	037	756	600	Spare 1
		753	013	077	656	001	
		753	013	037	756	000	
		753	513	037	756	600	
		753	013	077	656	001	
		753	013	037	756	000	
PDC # 1 382	SPARE 2 S	753	513	037	756	600	Spare 2
		753	013	077	656	001	
		753	013	037	756	000	
		753	513	037	756	600	
		753	013	077	656	001	
		753	013	037	756	000	
		753	513	037	756	600	
		753	013	077	656	001	
		753	013	037	756	000	
PDC # 1 383	SPARE 3 S	753	513	037	756	600	Spare 3
		753	013	077	656	001	
		753	013	037	756	000	

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CAM No.	PDC # 1 CMDH/REVIEW Printout	Uplink Octal				Rev Data	Command Description
701	AMHE SOVCL	753	533	235	356	624	Ambient Helium Reg SOV Closed
		753	053	367	056	047	
		753	073	424	756	070	
702	AMHE SOVOP	753	533	235	356	624	Ambient Helium Reg SOV Open
		753	053	267	256	045	
		753	013	237	356	004	
703	AM REP ON	753	533	235	356	624	Ambient Repress Mode On
		753	053	167	456	043	
		757	073	404	756	170	
704	ANT H GAIN	753	533	235	356	624	Antenna High Gain
		757	013	057	656	101	
		753	033	634	356	034	
705	ANT L GAIN	753	533	235	356	624	Antenna Low Gain
		757	013	057	656	101	
		753	033	634	356	034	
		753	533	235	356	624	
		757	013	157	456	103	
		753	053	426	756	050	
706	ANT OMNI	753	533	235	356	624	Antennas Omni
		757	013	057	656	101	
		753	033	634	356	034	
		753	533	235	356	624	
		757	013	157	456	103	
		757	053	406	756	150	
707	APS EN OFF	753	533	235	356	624	APS Ullage Engine Off
		753	053	367	056	047	
		757	073	404	756	170	
		753	533	235	356	624	
		753	053	167	456	043	
		753	033	434	756	030	
708	APS EN ON	753	533	235	356	624	APS Ullage Engine On
		753	053	267	256	045	
		757	073	404	756	170	
		753	533	235	356	624	
		753	053	167	456	043	
		757	033	414	756	130	

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CAM No.	PDC#1 CMDH/REVIEW Printout	Uplink Octal				Rev Data	Command Description
709	BURLOXSDCL	753	533	235	356	624	Burner LOX Shut- down Valve Closed
		753	053	067	656	041	
		753	033	035	756	020	
		753	533	235	356	624	
		753	053	067	656	041	
		753	013	037	756	000	
		753	533	235	356	624	
		753	053	067	656	041	
		757	033	015	756	120	
710	BLOXSDCLON	753	533	235	356	624	Burner LOX Shut- down Valve Closed On
		753	053	067	656	041	
		753	033	035	756	020	
711	BUR SHTDWN	753	533	235	356	624	Burner Shutdown
		753	053	067	656	041	
		753	033	035	756	020	
		753	533	235	356	624	
		753	053	067	656	041	
		753	053	426	756	050	
		753	533	235	356	624	
		753	053	067	656	041	
		753	033	235	356	024	
		753	533	235	356	624	
		753	053	267	256	045	
		757	053	606	356	154	
		753	533	235	356	624	
		753	053	367	056	047	
		753	013	237	356	004	
		753	533	235	356	624	
		753	053	267	256	045	
		753	053	626	356	054	
		753	533	235	356	624	
		753	053	067	656	041	
		757	033	015	756	120	
		753	533	235	356	624	
		753	053	167	456	043	
		753	033	035	756	020	
712	CAL OFF IU	753	533	235	356	624	Calibration Off IU
		757	013	057	656	101	
		757	013	416	756	110	
713	CAL ON IU	753	533	235	356	624	Calibration On IU
		757	013	157	456	103	
		753	013	436	756	010	
714	CAL OFF 4B	753	533	235	356	624	Calibration Off S-IVB
		753	053	067	656	041	
		753	033	634	356	034	

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PDC #1

<u>CAM No.</u>	<u>CMDH/REVIEW Printout</u>	<u>Uplink Octal</u>				<u>Rev Data</u>	<u>Command Description</u>
715	CAL ON 4B	753	533	235	356	624	Calibration On S-IVB
		753	053	267	256	045	
		753	053	426	756	050	
716	C-BD 1 INH	753	533	235	356	624	C-Band Transponder # 1 Inhibit
		757	013	357	056	107	
		753	033	035	756	020	
717	C-BD 2 INH	753	533	235	356	624	C-Band Transponder # 2 Inhibit
		757	013	257	256	105	
		757	033	015	756	120	
718	CBD 1&2 ON	753	533	235	356	624	C-Band Transponder # 1 and # 2 On
		757	013	357	056	107	
		757	033	015	756	120	
719	CCS XM DIS	753	533	235	356	624	CCS Transponder Disable
		757	013	157	456	103	
		757	053	207	356	144	
720	CCS XM ENB	753	533	235	356	624	CCS Transponder Enable
		757	013	357	056	107	
		753	053	626	356	054	

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CAM No.	PDC # CMDH/REVIEW Printout	Uplink Octal				Rev Data	Command Description
721	CHL SH CLD	753	533	235	356	624	Chilldown Shutoff Valve Closed
		753	053	267	256	045	
		757	033	215	356	124	
722	CHL SH OPN	753	533	235	356	624	Chilldown Shutoff Valve Open
		753	053	167	456	043	
		757	033	215	356	124	
723	COLD HE CL	753	533	235	356	624	Cold Helium SOV Closed
		753	053	367	056	047	
		753	053	426	756	050	
724	COLD HE OP	753	533	235	356	624	Cold Helium SOV Open
		753	053	367	056	047	
		757	053	406	756	150	
725	CRY REP ON	753	533	235	356	624	Cryo Repress Mode On
		753	053	067	656	041	
		753	013	237	356	004	
726	EDS 2 DIS	753	533	235	356	624	EDS #2 C/O Disable
		753	053	167	456	043	
		753	013	237	356	004	
727	ENG HCV EN	753	533	235	356	624	Engine Helium Control Valve Energized
		753	053	167	456	043	
		753	073	624	356	074	
		753	533	235	356	624	
		753	053	067	656	041	
		757	033	215	356	124	
728	ENG LH2 CL	753	533	235	356	624	Engine Main Fuel Valve Closed
		753	053	167	456	043	
		753	053	426	756	050	
		753	533	235	356	624	
		753	053	067	656	041	
		753	013	037	756	000	
		753	533	235	356	624	
		753	053	167	456	043	
		757	033	015	756	120	
729	ENG LH2 OP	753	533	235	356	624	Engine Main Fuel Valve Open
		753	053	157	456	043	
		753	073	624	356	074	
		753	533	235	356	624	
		753	053	167	456	043	
		757	053	406	756	150	
		753	533	235	356	624	
		753	053	067	656	041	
		757	033	215	356	124	

CAM No.	PDC#1 CMDH/REVIEW Printout	Uplink Octal				Rev Data	Command Description
730	ENG LOX CL	753	533	235	356	624	Engine Main Lox Valve Closed
		753	053	167	456	043	
		753	013	636	356	014	
		753	533	235	356	624	
		753	053	067	656	041	
		753	013	037	756	000	
		753	533	235	356	624	
		753	053	167	456	043	
		757	033	015	756	120	
731	ENG LOX OP	753	533	235	356	624	Engine Main Lox Valve Open
		753	053	167	456	043	
		753	073	624	356	074	
		753	533	235	356	624	
		753	053	067	656	041	
		753	013	636	356	014	
		753	533	235	356	624	
		753	053	067	656	041	
		757	033	215	356	124	
732	ENG PP OFF	753	533	235	356	624	Engine Pump Purge Off
		753	053	167	456	043	
		757	073	205	356	164	
733	ENG PP ON	753	533	235	356	624	Engine Pump Purge On
		753	053	067	656	041	
		757	013	416	756	110	
734	EXT FU LED	753	533	235	356	624	Extended Fuel Lead
		753	053	367	056	047	
		757	013	416	756	110	
		753	533	235	356	624	
		753	053	367	056	047	
		753	013	636	356	014	
		753	533	235	356	624	
		753	053	367	056	047	
		753	053	227	356	044	
		753	533	235	356	624	
		753	053	067	656	041	
		757	013	616	356	114	
735	FCC BN OFF	753	533	235	356	624	FCC Burn Mode Off
		757	013	257	256	105	
		753	073	225	356	064	
		753	533	235	356	624	
		757	013	057	656	101	
		757	033	015	756	120	

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CAM No.	PDC #1 CMDH/REVIEW Printout	Uplink Octal				Rev Data	Command Description
736	FCC BN ON	753	533	235	356	624	FCC Burn Mode On
		757	013	157	456	103	
		753	013	636	356	014	
		753	533	235	356	624	
		757	013	057	656	101	
		753	033	035	756	020	
737	H2O VL CSD	753	533	235	356	624	H2O Valve Closed
		757	013	257	256	105	
		753	033	235	356	024	
738	H2O VL OP	753	533	235	356	624	H2O Valve Open
		757	013	357	056	107	
		753	033	235	356	024	
739	HY PMP OFF	753	533	235	356	624	Hydraulic Pump Flight Mode Off
		753	053	167	456	043	
		757	073	005	756	160	
740	HY PMP ON	753	533	235	356	624	Hydraulic Pump Flight Mode On
		753	053	367	056	047	
		757	073	005	756	160	
741	LH2 CDP OF	753	533	235	356	624	LH2 Chilldown Pump Off
		753	053	367	056	047	
		753	053	626	356	054	
742	LH2 CDP ON	753	533	235	356	624	LH2 Chilldown Pump On
		753	053	167	456	043	
		757	053	207	356	144	
743	LH2 CHE DP	753	533	235	356	624	LH2 Coil Cold Helium Dump
		753	053	067	656	041	
		753	013	237	356	004	
		753	533	235	356	624	
		753	053	067	656	041	
		753	073	624	356	074	

CAM No.	PDC #1 CMDH/REVIEW Printout	Uplink Octal				Rev Data	Command Description
744	LH2 CVO OP	753	533	235	356	624	LH2 Continuous Vent Orifice SOV Open
		753	053	067	656	041	
		753	053	426	756	050	
		753	533	235	356	624	
		753	053	067	656	041	
		753	013	037	756	000	
		753	533	235	356	624	
		753	053	267	256	045	
		753	053	626	356	054	
745	LH2 CVR OP	753	533	235	356	624	LH2 Continuous Vent Relief Solenoid Open
		753	053	367	056	047	
		753	033	235	356	024	
		753	533	235	356	624	
		753	053	067	656	041	
		753	013	037	756	000	
		753	533	235	356	624	
		753	053	267	256	045	
		753	033	235	356	024	
746	LH2 CVS CL	753	533	235	356	624	LH2 Continuous Vent System Closed
		753	053	267	256	045	
		757	053	207	356	144	
		753	533	235	356	624	
		753	053	067	656	041	
		753	013	037	756	000	
		753	533	235	356	624	
		753	053	067	656	041	
		753	053	227	356	044	

CAM No.	PDC # 1 CMDH/REVIEW Printout	Uplink Octal				Rev Data	Command Description
747	LH2 CVS OP	753	533	235	356	624	LH2 Continuous Vent System Open
		753	053	067	656	041	
		753	053	426	756	050	
		753	533	235	356	624	
		753	053	367	056	041	
		753	033	235	356	024	
		753	533	235	356	624	
		753	053	067	656	041	
		753	013	037	756	000	
		753	533	235	356	624	
		753	053	267	256	045	
		753	053	626	356	054	
		753	533	235	356	624	
		753	053	267	256	045	
		753	033	235	356	024	
748	LH2LVOP<	753	533	235	356	624	LH2 Latching Relief Valve Open and Latched
		753	053	267	256	045	
		757	033	414	756	130	
		753	533	235	356	624	
		753	053	067	656	041	
		753	013	037	756	000	
		753	533	235	356	624	
		753	053	167	456	043	
		753	073	424	756	070	
		753	533	235	356	624	
		753	053	067	656	041	
		753	013	037	756	000	
		753	533	235	356	624	
		753	053	267	256	045	
		757	053	406	756	150	
		753	533	235	356	624	
		753	053	067	656	041	
		753	013	037	756	000	
		753	533	235	356	624	
		753	053	267	256	045	
		757	013	416	756	110	
749	LH2LRVOPOF	753	533	235	356	624	LH2 Latching Relief Valve Open and Off
		753	053	267	256	045	
		757	053	406	756	150	
750	LH2LRVOPON	753	533	235	356	624	LH2 Latching Relief Valve Open and On
		753	053	267	256	045	
		757	033	414	756	130	

CAM No.	PDC # 1 CMDH/REVIEW Printout	Uplink Octal				Rev Data	Command Description
751	LH2LVUL&CL	753	533	235	356	624	LH2 Latching Relief Valve Unlatched and Closed
		753	053	267	256	045	
		757	033	414	756	130	
		753	533	235	356	624	
		753	053	067	656	041	
		753	013	037	756	000	
		753	533	235	356	624	
		753	053	267	256	045	
		757	053	406	756	150	
752	LH2 RCV CL	753	533	235	356	624	LH2 Repress Control Valve Close
		753	053	067	656	041	
		753	073	624	356	074	
		753	533	235	356	624	
		753	053	067	656	041	
		753	033	235	356	024	
753	LH2 RCV OP	753	533	235	356	624	LH2 Repress Control Valve Open
		753	053	067	656	041	
		753	033	235	356	024	
		753	533	235	356	624	
		753	053	067	656	041	
		753	073	624	356	074	
754	LH2 TK BCC	753	533	235	356	624	LH2 Tank Vent Boost Close Cycle
		753	053	367	056	047	
		753	033	434	756	030	
		753	533	235	356	624	
		753	053	067	656	041	
		753	013	037	756	000	
		753	533	235	356	624	
		753	053	367	056	047	
		757	033	414	756	130	
755	LOX CDP OF	753	533	235	356	624	LOX Chilldown Pump Off
		753	053	167	456	043	
		753	013	436	756	010	
756	LOX CDP ON	753	533	235	356	624	LOX Chilldown Pump On
		753	053	267	256	045	
		757	013	217	356	104	

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<u>CAM No.</u>	<u>CMDH/REVIEW Printout</u>	<u>Uplink Octal</u>				<u>Rev Data</u>	<u>Command Description</u>
757	LOXNPV O&L	753	533	235	356	624	LOX NPV Valve Open and Latched
		753	053	267	256	045	
		753	073	025	756	060	
		753	533	235	356	624	
		753	053	067	656	041	
		753	013	037	756	000	
		753	533	235	356	624	
		753	053	167	456	043	
		757	013	416	756	110	
		753	533	235	356	624	
		753	053	067	656	041	
		753	013	037	756	000	
		753	533	235	356	624	
		753	053	367	056	047	
		757	033	215	356	124	
		753	533	235	356	624	
		753	053	067	656	041	
		753	013	037	756	000	
		753	533	235	356	624	
		753	053	267	256	045	
		757	013	616	356	114	
758	LOXNPVU&CL	753	533	235	356	624	LOX NPV Valve Un- latched and Closed
		753	053	267	256	045	
		753	073	025	756	060	
		753	533	235	356	624	
		753	053	067	656	041	
		753	013	037	756	000	
		753	533	235	356	624	
		753	053	367	056	047	
759	LOXRCVOPOF	757	033	215	356	124	LOX Repress Control Valve Off
		753	533	235	356	624	
		753	053	367	056	047	
		753	013	436	756	010	
		753	533	235	356	624	
		753	053	367	056	047	
760	LOXRCVOPON	753	013	237	356	004	LOX Repress Control Valve Open
		753	533	235	356	624	
		753	053	367	056	047	
		753	013	436	756	010	
		753	533	235	356	624	
		753	053	367	056	047	

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CAM No.	PDC #1 CMDH/REVIEW Printout	Uplink Octal				Rev Data	Command Description
761	LOX RCV OP	753	533	235	356	624	LOX Repress Control Valve Open On
		753	053	367	056	047	
		753	013	436	756	010	
762	LOX TK BCC	753	533	235	356	624	LOX Tank Vent Boost Close Cycle
		753	053	167	456	043	
		757	053	606	356	154	
		753	533	235	356	624	
		753	053	067	656	041	
		753	013	037	756	000	
		753	533	235	356	624	
		753	053	067	656	041	
763	LOX VT CL	753	533	235	356	624	LOX Vent Closed
		753	053	067	656	041	
		753	053	626	356	054	
764	LOX VT OP	753	533	235	356	624	LOX Vent Open
		753	053	167	456	043	
		753	033	235	356	024	
765	PASS DIS	753	533	235	356	624	Passivation Disable
		753	053	267	256	045	
		753	073	424	756	070	
766	PT LS ARM	753	533	235	356	624	Point Level Sensor Arming
		753	053	067	656	041	
		753	033	434	756	030	
767	P&R VL CL	753	533	235	356	624	Prevals and Recirc Valves Closed
		753	053	067	656	041	
		757	033	414	756	130	
		753	533	235	356	624	
		753	053	267	256	045	
768	P&R VL OP	757	033	215	356	124	Prevalves and Recirc Valves Open
		753	533	235	356	624	
		753	053	367	056	047	
		753	053	227	356	044	
		753	533	235	356	624	
		753	053	167	456	043	
769	PREVAL CSD	757	033	215	356	124	Prevals Closed
		753	533	235	356	624	
		753	053	067	656	041	
		757	033	414	756	130	

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CAM No.	PDC #1 CMDH/REVIEW Printout					Rev Data	Command Description
770	INV&PWR OF	753	533	235	356	624	PU Inverter and DC Power Off
		753	053	167	456	043	
		757	073	604	356	174	
771	INV&PWR ON	753	533	235	356	624	PU Inverter and DC Power On
		753	053	067	656	041	
		757	073	205	356	164	
772	PMR OF 5.0	753	533	235	356	624	PU Programmed Mix- ture Ratio Off (5.0)
		753	053	167	456	043	
		757	013	616	356	114	
773	4.5 EMR ON	753	533	235	356	624	PU Valve 4.5 EMR On
		753	053	067	656	041	
		757	073	604	356	174	
774	5.5 EMR ON	753	533	235	356	624	PU Valve 5.5 EMR On
		753	053	267	256	045	
		753	053	227	356	044	
775	SEC BR OFF	753	533	235	356	624	Second Burn Relay Off
		753	053	067	656	041	
		757	073	005	756	160	
776	ST TK 3SEC	753	533	235	356	624	Start Tank Three- Second Vent
		753	053	367	056	047	
		757	073	604	356	174	
		753	013	037	756	000	
		753	013	037	756	000	
		753	013	037	756	000	
		753	013	037	756	000	
		753	013	037	756	000	
		753	013	037	756	000	
		753	013	037	756	000	
		753	013	037	756	000	
		753	013	037	756	000	
		753	013	037	756	000	
		753	013	037	756	000	
		753	553	027	756	640	
		753	533	235	356	624	
		753	053	267	256	045	
		757	073	604	356	174	
		753	553	027	756	640	
		753	533	235	356	624	
		753	053	267	256	045	
		757	073	604	356	174	
		753	553	027	756	640	
777	STBTL OPOF	753	533	235	356	624	Start Bottle Control Valve Open Off
		753	053	267	256	045	
		757	073	604	356	174	

CAM No.	PDC #1 CMDH/REVIEW Printout	Uplink Octal				Rev Data	Command Description
778	STBTL OPON	753	533	235	356	624	Start Bottle Control Valve Open On
		753	053	367	056	047	
		757	073	604	356	174	
779	SSCO 1S IU	753	533	235	356	624	Switch Selector Checkout All Ones- IU
		757	013	756	056	117	
		757	073	604	356	174	
780	SSCO 1S 4B	753	533	235	356	624	Switch Selector Checkout All Ones- SIVB
		753	053	766	056	057	
		757	073	604	356	174	
781	SSCO OS IU	753	533	235	356	624	Switch Selector Checkout All Zeros- IU
		757	013	057	656	101	
		753	013	037	756	000	
782	SSCO OS 4B	753	533	235	356	624	Switch Selector Checkout All Zeros- SIVB
		753	053	067	656	041	
		753	013	037	756	000	

55.5.3.2 LM RTCs. Not required for AS-506.

55.5.3.3 LM DCA/DUA Test Words

CAM No.	PDC #1 CMDH/REVIEW Printout	Uplink Octal				Rev Data	Command Description
500	DCA ENABLE	35000000				000000	DCA/DUA Enable
504	DCDR A INH	35040000				040000	Decoder A Inhibit
510	DCDR B INH	35100000				100000	Decoder B Inhibit
514	DCA SF TST	35140000				140000	DCA/DUA Self Test

55.5.3.4 LM PRA Commands. Not required for AS-506.

55.5.3.5 LGC/CMC Computer Words

<u>CAM No.</u>	<u>CMDH/</u> <u>Printout</u>	<u>PDC #1</u> <u>REVIEW</u>	<u>Uplink Octal</u>	<u>Rev Data</u>	<u>Command Description</u>
851	LGC VERB CMC VERB		31613504 43613504	21	DSKY Verb (V)
852	LGC NOUN CMC NOUN		31770174 43770174	37	DSKY Noun (N)
853	LGC CLEAR CMC CLEAR		31760370 43760370	36	DSKY Clear
854	LGC ENTER CMC ENTER		31740760 43740760	34	DSKY Enter (E)
855	LGC ZERO CMC ZERO		31603700 43603700	20	DSKY Zero (0)
856	LGC ONE CMC ONE		31417404 43417404	01	DSKY One (1)
857	LGC TWO CMC TWO		31427210 43427210	02	DSKY Two (2)
858	LGC THREE CMC THREE		31437014 43437014	03	DSKY Three (3)
859	LGC FOUR CMC FOUR		31446620 43446620	04	DSKY Four (4)
860	LGC FIVE CMC FIVE		31456424 43456424	05	DSKY Five (5)
861	LGC SIX CMC SIX		31466230 43466230	06	DSKY Six (6)
862	LGC SEVEN CMC SEVEN		31476034 43476034	07	DSKY Seven (7)
863	LGC EIGHT CMC EIGHT		31505640 43505640	10	DSKY Eight (8)
864	LGC NINE CMC NINE		31515444 43515444	11	DSKY Nine (9)
865	LGC PLUS CMC PLUS		31721350 43721350	32	DSKY Plus (+)
866	LGC MINUS CMC MINUS		31731154 43731154	33	DSKY Minus (-)
867	LGC UPBLK CMC UPBLK		31400000 43400000	00	DSKY All Zero
868	LGC ERRST CMC ERRST		31623310 43623310	22	DSKY Error Rst

55.5.3.6 CSM CTE Update

CAM No.	PDC # 1 CMDH/REVIEW		Rev Data	Command Description
	Printout	Uplink Octal		
601	CTE UPDATE	44XXXXXXXX	XX XX XX XX	$\Delta T = X$ CTE Update

55.5.3.7 CSM Test Words

CAM No.	PDC # 1 CMDH/REVIEW		Rev Data	Command Description
	Printout	Uplink Octal		
602	UDL TEST A	4032000002	32000002	Test Word A
603	UDL TEST B	4032777775	32777775	Test Word B

55.5.3.8 CSM RTCs

CAM No.	PDC # 1 CMDH/REVIEW		Rev Data	Command Description
	Printout	Uplink Octal		
604	ALARM OFF	4604	04	Crew Alarm Off
605	ALARM ON	4605	05	Crew Alarm On
606	BIT RAT LO	4665	65	PCM Bit Rate Low
607	BIT RAT HI	4664/4671	64/71	PCM Bit Rate High
608	BIT RAT RS	4664/4670	64/70	Astronaut Control of PCM Bit Rate
609	RT 1.02 ON	4632/4637	32/37	S-band PCM Mode On
610	RT PCM OFF	4637/4633	37/33	S-band PCM Mode Off
611	RT PCM RST	4632/4636	32/36	Astronaut Control of S-band PCM Mode
612	FM ON	4641/4645	41/45	FM On
613	FM OFF	4641/4644	41/44	FM Off
614	BU FM OFF	4640/4651	40/51	Backup Voice FM Off
615	USB MD RST	4650/4640	50/40	USB Mode Reset
616	DSE TP FWD	4672/4677	72/77	DSE Tape Forward
617	DSE TP STP	4676/4373	76/73	DSE Tape Stop
618	DSE TP RWD	4673/4677	73/77	DSE Tape Rewind
619	TP CTL RST	4676/4672	76/72	TAPE Control Reset
620	DSE EL REC	4662/4667	62/67	DSE Electronics Record
621	DSE EL OFF	4663/4666	63/66	DSE Electronics Off
622	DSE EL PBK	4663/4667	63/67	DSE Electronics Playback
623	DSE EL RST	4662/4666	62/66	DSE Electronics Reset
624	SEL CSM PB	4652/4657	52/57	S&L CSM Playback Data

CAM No.	PDC # 1 CMDH/REVIEW		Rev Data	Command Description
	Printout	Uplink Octal		
625	SEL LM PB	4653	53	Select LM Playback Data
626	PB MD RST	4652/4656	52/56	Playback Mode Reset
627	PWR AMP OF	4643/4646	43/46	Power Amp Off
628	PWR AMP LO	4647/4643	47/43	Power Amp Low
629	PWR AMP HI	4642/4647	42/47	Power Amp High
630	PWR AMP RS	4642/4646	42/46	Power Amp Reset
631	RANGE DIS	4623	23	Ranging Disable
632	RANGE ENBL	4622/4627	22/27	Ranging Enable
633	RANGE RST	4622/4626	22/26	Ranging Reset
PDC # 5 * 634	SLVO RST 1	4530/4532	30/32	Salvo Reset 1
** 635	SLVO RST 2	4572/4570	72/70	Salvo Reset 2
636	D OMNI ON	4675	75	D Omni Antenna Select
637	ANTNA RST	4674	74	Antenna Reset
638	ACE 0 DSBL	4610	10	ACE CMC Zero Disable
639	ACE 0 ENBL	4611	11	ACE CMC Zero Enable
640	ACE 1 DSBL	4614	14	ACE CMC One Disable
641	ACE 1 ENBL	4615	15	ACE CMC One Enable

55.5.3.9 CSM Priorities

CAM No.	PDC # 1 CMDH/REVIEW		Rev Data	Command Description
	Printout	Uplink Octal		
869	ABT LT B N	4607	07	Abort Light B On
870	ABT LT A N	4601	01	Abort Light A On
871	ABT LT B F	4606	06	Abort Light B Off
872	ABT LT A F	4600	00	Abort Light A Off

PDC # 5 | * RESETS RTC'S 00,04,10,14,06, 22/26 AND 32/36 .
 ** " " 50/40, 64/70, 74, 42/46, 52/56, 62/66 AND 76/72 .

55.5.4 COMMAND LOADS

<u>CSM Loads</u>	<u>Verb</u>	<u>Description</u>
00XX	71	CMC CSM Navigation
06XX	71	CMC Landing Site Vector
07XX	73	CMC Time Increment
08XX	70	CMC Liftoff Time
09XX	71	CMC LM Navigation
10XX	71	CMC External ΔV
12XX	71	CMC REFSMAT
13XX	71	CMC Retro External ΔV
14XX	71	CMC Entry
18XX	71, 72	CMC Erasable Memory A
19XX	71, 72	CMC Erasable Memory B

<u>LM Loads</u>	<u>Verb</u>	<u>Description</u>
20XX	71	LGC LM Navigation
21XX	71	LGC CSM Navigation
22XX	71	LGC External V
23XX	71	LGC REFSMAT
24XX	73	LGC Time Increment
25XX	70	LGC Liftoff Time
26XX	71	LGC Landing Site Vector
28XX	72	LGC Descent
38XX	71, 72	LGC Erasable Memory A
39XX	71, 72	LGC Erasable Memory B

<u>SLV Loads</u>	<u>Description</u>
40XX	SLV Time Base
41XX	SLV Sequence Initiate 1
42XX	SLV Sequence Initiate 2
43XX	SLV Sequence Initiate 3
44XX	SLV Sequence Initiate 4
45XX	SLV Switch Select 1
46XX	SLV Switch Select 2
47XX	SLV Switch Select 3
48XX	SLV Switch Select 4
49XX	SLV Navigation
50XX	SLV Sequence Initiate 5
51XX	SLV Sequence Initiate 6
52XX	SLV Sequence Initiate 7
53XX	SLV Sequence Initiate 8
57XX	SLV Orbit Target
58XX	SLV General Update A
59XX	SLV General Update B

<u>MISC Load</u>	<u>Description</u>
60XX	GMT of Liftoff

55.6 COMMAND CAM FUNCTIONS

CAM codes and associated printouts are shown in table 55-3. A CAM truth table of desired functions and required conditions is shown in table 55-4.

55.6.1 SELECTION OF COMMAND FUNCTIONS OR MODES

- a. Press CLEAR pushbutton
- b. Select ZZZ (refer to table 55-3)
- c. Press INITIATE pushbutton
- d. The high-speed printer will print the request (refer to table 55-3)
- e. Verify that this is the function you wish to perform
- f. Press INITIATE pushbutton
- g. The command program will select the command function and the high-speed printer will print the function (refer to table 55-3).

Table 55-3. CAM Codes and Printouts

CAM Code	Function	HSD Request Printout	HSP Function Selected
970	Vehicle 1	VEHICLE 1 REQ	VEHICLE 1 SELECTED
971	Vehicle 2	VEHICLE 2 REQ	VEHICLE 2 SELECTED
972	L/L Correction	L/L CORRECTION REQ	(See paragraph 55.6.4)
973	Load Enable	LOAD ENABLE REQ	CMD LOAD ENABLE
974	Load Disable	LOAD DISABLE REQ	CMD LOAD DISABLE
975	Temporary Load Clear	TEMP LOAD CLEAR REQ	LOAD LLDD TEMP CLEAR
976	Command Terminate	CMD TERMINATE REQ	(Manual or auto*) CMD TERMINATE then COMMAND TERMINATED
977	Flight Control Mode	F/C MODE REQ	CMD F/C MODE
978	M&O Mode	M/O MODE REQ	CMD M/O MODE
979	Mode 1	MODE 1 REQ	CMD MODE 1
980	Mode 2	MODE 2 REQ	CMD MODE 2
981	Inventory - Teletype	LOAD INV TTY REQ	INV SUM IN PROGRESS
982	Inventory - High Speed Printout	LOAD INV HSP REQ	PRINTOUT OF LOADS IN CORE

*Auto results only from termination of a priority

Table 55-3. CAM Codes and Printouts (cont)

CAM Code	Function	HSD Request Printout	HSP Function Selected
983	MAP Override On	MAP OVRD ON REQ	MAP OVERRIDE ON
984	MAP Override Off	MAP OVRD OFF REQ	MAP OVERRIDE OFF
986	USB Mode	USB CARRIER REQ	USB CARRIER SELECTED
988	USB Loop Test	STATUS TEST REQ USB	
990	CMD Parameter List	CMD PARAM LIST REQ	See HSP No. 88
991	Command Hist - HSP 1	CMDH VVV SSS TP REQ	
992	Command Hist - HSP 2	CMDH VVV SSS TP REQ	
993	Command Hist - TTY 1	CMDH VVV SSS TP REQ	
994	Command Hist - TTY 2	CMDH VVV SSS TP REQ	
996	End-of File	CMDH EOF REQ	CMDH EOF
999	Cancel CAM	CANCEL CAM	

Table 55-4. Command CAM Truth Table

Function Requested \ Conditions Required	M1 M&O	M1 FC	M2 FC	CAM Uplink or Compare	MCC Uplink or Compare	Load in GCA
Command Uplink	-	+	-	-	-	+ (Load Up1)
Priority RTC Upk	-	+	-	0	-	0
Review	0	0	0	-	-	+
Load Inv - HSP/TTY	0	0	0	-	-	0
Load Clear	-	+	-	-	-	+
Temp Load Clear	-	+	-	-	-	+ (Temp)
Command Terminate	-	+	-	+	-	0
USB Mode	-	+	-	-	-	0
Map Override	-	+	-	-	-	0
Compare	-	+	-	-	-	+
Line-by-Line	-	+	-	-	-	+
CMD Hist (HSP/TTY)	0	0	0	-	-	0
History EOF*	0	0	0	-	-	0
Mode 1	0	0	+	-	-	0
Mode 2	-	+	0	-	-	0
FC Mode	+	0	0	-	-	0
M&O	0	+	-	-	-	0
Load Enable/Disable	0	0	0	-	-	0
UHF/USB Loop Test	-	0	0	-	-	0
Command Param List	0	0	0	-	-	0
Vehicle 1/2	-	+	-	-	-	0
<p style="text-align: center;"><u>Legend</u></p> <p>(+) Required (-) Illegal</p> <p>(0) Of no consequence * Illegal during history</p>						

55.6.2 UPLINKING OF CMC/LGC LOADS AND RTCs

- a. Press CLEAR pushbutton
- b. Select the transmission path
- c. The following is an example to uplink CMC Load 1024:

(1) To uplink the Load Preamble:

- (a) Select CSM, LOAD 1-3-5 AND VERB INIT
- (b) Press the three-digit number combination of 024 (last digit of load and the sequence number)
- (c) Press INIT pushbutton
- (d) The command program will cause one of the following printouts:

LOAD LLDD VV FFF REQ

or

LOAD LLDD NOT FOUND

- (e) When the load is ready press the UPLINK and INIT pushbuttons
- (f) The command program will uplink the verb and two-digit preamble and cause one of the following high-speed printouts:

UPL VI LLDD CCC YYY O

then

CMD LLDD VERIFIED

or

CMD LLDD GND REJ Z

- (2) To enter the preamble into the CMC/LGC computer or to uplink RTCs:
 - (a) Press CLEAR pushbutton
 - (b) Deselect LOAD 1-3-5
 - (c) Select RTC
 - (d) Press 854 for DSKY enter or select the associated CAM code for the RTC to be uplinked. (Refer to paragraph 55.5.3 for the specific numbers.)
 - (e) Press INIT pushbutton

- (f) The command program will cause one of the following printouts:

RTC ZZZ VV JJJ REQ

or

RTC XXXX NOT FOUND

- (g) When the RTC is ready, press the UPLINK and INIT pushbuttons

- (h) The command program will uplink the RTC and cause one of the following high-speed printouts:

UPL EEEEEEEEEEE CCC YYY O

then

CMD XXXX VERIFIED

or

CMD XXXX S/C REJECT

or

CMD XXXX GND REJ Z

- (3) To uplink the data portion of the CMC/LGC load, or an SLV load uplink:

- (a) Press CLEAR pushbutton

- (b) Deselect RTC

- (c) Select LOAD 1-3-5 or 0-2-4 AND LOAD INIT

- (d) Press the number combination of the last digit of load and the sequence number

- (e) Press INIT pushbutton

- (f) The command program will cause the following printout:

LOAD LLDD VV FFF REQ

- (g) When the load is ready, press the LOAD 1-3-5, UPLINK, and INIT pushbuttons

- (h) The command program will cause the following high-speed printout:

UPL LI LLDD CCC YYY O

then (for SLV loads)

CMD LLDD VERIFIED

or

CMD LLDD S/C REJECT

or

CMD LLDD GND REJ Z

then (for CMC/LGC loads)

COMPARE LLDD

OK COMPARE LLDD

or

COMPARE LLDD

COMP ERR

01

02

03

(Octal IDs of line failures)

COMPARE VALID

or

COMPARE LLDD

COMP ERR NO TLM

- (i) Once the CMC or LGC load has been uplinked and has compared with no errors, it must be entered or terminated at the onboard computer

- (j) To enter the uplinked load data into the spacecraft computer, Final Enter (V33E), must be uplinked for each symbol of V33E

- (k) To terminate (reject) the uplinked Load Preamble and Load from the spacecraft computer, Terminate (V34E) must be uplinked for each symbol of V34E.

55.6.3 MANUAL BUFFER COMPARISON

- a. Press CLEAR pushbutton
- b. Select CSM or LM and LOAD 1-3-5 or LOAD 0-2-4
- c. Press the three-digit number combination corresponding to the last digit of the load and the two sequence digits
- d. Press COMPARE pushbutton
- e. Press INIT pushbutton

- f. The command program will cause one of the following printouts:

LOAD LLDD VV FFF REQ

or

LOAD LLDD NOT FOUND

- g. When the load is ready, press INIT pushbutton
- h. The command program will cause one of the following high-speed printouts:

COMPARE LLDD

OK COMPARE LLDD

or

COMPARE LLDD

COMP ERR

01

02

03

(Octal IDs of line failures)

COMPARE VALID

or

COMPARE LLDD

COMP ERR NO TLM

COMPARE VALID

55.6.4 LINE-BY-LINE CORRECTION

- a. Press CLEAR pushbutton
- b. Press 972 number combination
- c. Press INIT pushbutton
- d. The command program will cause the following high-speed printout:

L/L CORRECTION REQ

- e. Verify that this is the function you wish to perform
- f. Press UPLINK and INIT pushbuttons

- g. The command program will automatically uplink all data lines that have previously not compared and causes the following high-speed printouts:

UPL LL LLDD CCC YYY O

then

COMPARE LLDD

OK COMPARE LLDD

or

COMPARE LLDD

COMP ERR

01

02

03

(Octal IDs of line failures)

COMPARE VALID

or

COMPARE LLDD

COMP ERR NO TLM

55.6.5 LOAD CLEAR

- a. Press CLEAR pushbutton
- b. Select CSM, LM, or SLV and LOAD 1-3-5 or LOAD 0-2-4
- c. Press the three-digit number combination corresponding to the last digit of the load and the two sequence digits
- d. Press LOAD CLEAR pushbutton
- e. Press INIT pushbutton
- f. The command program will cause one of the following high-speed printouts:

LOAD LLDD VV FFF REQ

or

LOAD LLDD NOT FOUND

- g. Press INIT pushbutton
- h. The command program will cause the following high-speed printout:

LOAD LLDD CLEAR

GCA STATUS AA

55.6.6 LOAD REVIEW

- a. Press CLEAR pushbutton
- b. Select CSM, LM, or SLV and LOAD 1-3-5 or LOAD 0-2-4
- c. Press the three-digit number combination corresponding to the last digit of the load and the two sequence digits
- d. Press REVIEW pushbutton
- e. Press INIT pushbutton
- f. The command program will cause one of the following high-speed printouts:

LOAD LLDD VV FFF REQ

or

LOAD LLDD NOT FOUND

- g. Press INIT pushbutton
- h. The command program will print the octal contents of the load on the high-speed printer.

55.6.7 RTC REVIEW

- a. Press CLEAR pushbutton
- b. Select CSM, LM, or SLV and RTC
- c. Press the three-digit number combination corresponding to the RTC
- d. Press REVIEW pushbutton
- e. Press INIT pushbutton
- h. The command program will print the English title and octal contents of the RTC on the high-speed printer.

55.6.8 COMMAND HISTORY RETRIEVAL

- a. Press CLEAR pushbutton
- b. Select CSM, LM, or SLV
- c. Press the desired number combination:

991 - Command History - HSP 1

992 - Command History - HSP 2

993 - Command History - TTY 1

994 - Command History - TTY 2

- d. Press INIT pushbutton
- e. The command program will cause the following high-speed printout:

CMDH VVV SSS TP REQ

- f. Press INIT pushbutton
- g. Once data retrieval has begun the following printouts will occur:

CH CSM 1

CH CSM 2

CH LM 1

CH LM 2

CH SLV 1

CH SLV 2

- h. The command program will print out on the high-speed printer:

Printout of desired history (HSP only)

or

NO CMDS XMITTED

55.6.9 COMMAND HISTORY ABORT

- a. Press CLEAR pushbutton
- b. Select CSM, LM, or SLV
- c. Press 99X (X = history in progress)
- d. Press INIT pushbutton
- e. The command program will cause the following high-speed printout:

CMDH VVV SSS TP REQ

- f. Press INIT pushbutton
- g. The command program will terminate (abort) the history in progress and cause the following printout:

CMD HISTORY ABORTED

AS-506 Supplements to NOD

h. If the program types:

RTC DISCONNECTED

connect RTC switch and press START STEP switch

i. If the program types:

BOOT I DISCONNECTED

set BOOTSTRAP I and press START STEP switch

j. 1232 types:

INITIATION - CMD

SYS, XXX, ↑

SYS, CMD, ↑

k. Operator types:

CMD, ↑ (Normal Command)

ABT, ↑ (Abort Launch Capability - MIL only)

l. 1232 types:

NCG, XXX, ↑

NCG,

m. Operator types:

725

NNN, ↑ (NNN - NCG 3-digit number)

n. 1232 types:

MIS, X, ↑

MIS,

o. Operator types:

X ↑ 7 1 ↑

p. 1232 types:

STA, XX, ↑

STA,

q. Operator types:

XX, (Station ID - 2 digits. Refer to Section 55 of NOD)

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SOMETHING
SEEMS
TO BE
MISSING FLT

r. 1232 types:

GMT, YR, ↑

GMT,

s. Operator types:

(year - 2 digits), ↑

t. 1232 types:

LOT, YR, MO, DA, HR, MN, SEC, ↑

LOT,

u. Operator types:

(year - 2 digits), (month - 2 digits),

(day - 2 digits), (hour - 2 digits),

(minute - 2 digits), (second - 2 digits), ↑

v. 1232 types:

CMD READY or ABT READY

w. The program rewinds the recovery tape and writes 2 iterations of main frame and EMU core (CBARF image). If the CBARF write operation is unsuccessful, the program will type out:

TYPE N MTU ERR ZZZZZ

Refer to UCATS for an explanation of errors and corrective actions. If desired, press START STEP switch to attempt to write 2 iterations again. Whenever corrective action fails, set A register not equal to zero and press START switch. This causes the program to bypass the CBARF WRITE.

x. If the CBARF WRITE operation was successful or if the program was forced to bypass errors, the setting of JUMP key 2 will be sensed. If JUMP key 2 is in the up position, a fresh tape is assumed to be mounted on the command recovery handler. The program will write four iterations of the CCDP on the command recovery tape and position it for subsequent command recovery operations. If the CCDP write operation is unsuccessful, the program will type out:

TYPE N MTU ERR ZZZZZ

Refer to UCATS for an explanation of errors and corrective actions.

y. If JUMP key 2 was down or if the program was forced to bypass errors, the program will 4-stop, allowing a command recovery option. Refer to paragraph 55.9.3.3. for command recovery.

- z. Reset JUMP key 2 after the CBARF image is written
- aa. Mount the CBARF paper tape in the 1232 reader
- ab. Set the automatic recovery switch up. Do not set JUMP key 1 up unless directed by MCC or GSFC.
- ac. When the command program is cycling, the M&O will select M&O mode and instruct the computer technician to insert the following via the I/O routine:

Vehicle	SBC	MWP
C1	C	275 Ms
L1	C	275 Ms
S1	C	275 Ms

- ad. At approximately TLI + 50 minutes, upon direction from the NC, configure the command program as follows:

Vehicle	MWP
C1	2.8 Sec
L1	2.8 Sec
S1	500 Ms

- ae. At approximately TLI + 3 hours, upon direction from the NC, change the SLV MWP to 750 milliseconds.
- af. At approximately TLI + 10 hours, upon direction from the NC, change the CSM, LM, and SLV RTN to 0.

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55.7 COMMAND PROGRAM OPERATIONAL AIDS

a. High-speed Printer and 1232 Typewriter Symbols. The following symbols will be used extensively throughout the command portion of this Section to identify the type 1232 console and high-speed printouts:

<u>Symbol</u>	<u>Meaning</u>
AA	Available slots in GCA
AAA	CSM, idle, IU, LM
AAAAAA	Address
B	Tape transport ID 1 = Recovery 2 = History
CCC	Initiating source of uplink (CAM or MCC)
CH	Channel Number
CK	Type of error detected 1 = RTC group data checksum error 2 = Load data checksum error 3 = 1232 input parameter checksum error 4 = Mode variable checksum error 5 = Checksum error detected during load input processing 6 = UDB redundancy formatting checksum error 7 = DLV instruction checksum error 8 = UDD instruction checksum error
DD	Sequence Number (1 - 63)
EE	No. of data errors
EEEEEEEEEE	English of the RTC
FF	No. of time-out errors
FFF	Function requested (UPL, REV, CMP or CLR)
HH	Input word number in error
JJJ	Function requested (UPL or REV)
KK	Count of the 1232-message requests which were lost while the 1232-message request stack was in an overflow state
LI	Load initiate
LL	Load number (00 - 59) or Line-by-Line

S 502 NEW PAGE

<u>Symbol</u>	<u>Meaning</u>
N	Type of MTU Error 1 = Bad CBARF Write 2 = Bad recovery of history read 3 = Band recovery or history write 4 = Bad tape marks written after the dummy recovery record 5 = Bad tape positioning after a recovery read or write operation, or a CBARF write operation. 6 = Request for status indicating that either command history or command recovery tape unit, or both, are incorrectly configured.
O	Status of MAP Override (O = ON, blank - OFF)
P	Type number (1 or 2)
RRR	Bit rate (HBR, LBR, blank for IU)
SSS	Source (TTY or HSP)
V	Indicates which vehicle (1 or 2) has switched TLM bit rates
VI	Verb initiate
VV	Vehicle and number
VVV	Vehicle (CSM, LM or SLV)
X	Initialization phase 1 = Reinitialization (P = 4000) 2 = Restarting (P = 4010) 3 = Recycling (P = 4020)
XXX	Telemetry Format change
XXXX or ZZZ	CAM Number
Y	Telemetry Indication 0 = Replace request from MCC 1 = Retrieve request from MCC 2 = Replace request from GSFC 3 = Retrieve request from GSFC
YY	Data lost during overflow: 01 = CAPs 03 = CEFs 04 = LOT Other combination illegal
YYY	Transmission path (UHF or USB)
Z	Reasons for Ground Rejection: 1 = The required uplink path cannot be established 2 = A checksum error occurs during data retrieval 3 = A CMC/LGC keycode error is detected during formatting 4 = A data bit error is detected during formatting 5 = A RF loop check error exists, MAP verification is required and has not been received from the spacecraft, and the required number of retransmissions has been completed.
ZZ	Type of error, see HSD errors
ZZZZZ	Status data received from MTUs (bits 0 - 14).

1. The first part of the document is a list of names and addresses. The names are: John Doe, Jane Smith, and Bob Johnson. The addresses are: 123 Main Street, 456 Elm Street, and 789 Oak Street.

2. The second part of the document is a list of dates and times. The dates are: January 1, 1990, February 1, 1990, and March 1, 1990. The times are: 10:00 AM, 2:00 PM, and 6:00 PM.

3. The third part of the document is a list of items and quantities. The items are: Apples, Bananas, and Oranges. The quantities are: 10, 20, and 30.

4. The fourth part of the document is a list of prices and totals. The prices are: \$1.00, \$2.00, and \$3.00. The totals are: \$10.00, \$20.00, and \$30.00.

5. The fifth part of the document is a list of names and addresses. The names are: John Doe, Jane Smith, and Bob Johnson. The addresses are: 123 Main Street, 456 Elm Street, and 789 Oak Street.

6. The sixth part of the document is a list of dates and times. The dates are: January 1, 1990, February 1, 1990, and March 1, 1990. The times are: 10:00 AM, 2:00 PM, and 6:00 PM.

7. The seventh part of the document is a list of items and quantities. The items are: Apples, Bananas, and Oranges. The quantities are: 10, 20, and 30.

8. The eighth part of the document is a list of prices and totals. The prices are: \$1.00, \$2.00, and \$3.00. The totals are: \$10.00, \$20.00, and \$30.00.

<u>Symbol</u>	<u>Meaning</u>												
N	Type of MTU Error 1 = Bad CBARF Write 2 = Bad recovery of history read 3 = Band recovery or history write 4 = Bad tape marks written after the dummy recovery record 5 = Bad tape positioning after a recovery read or write operation, or a CBARF write operation. 6 = Request for status indicating that either command history or command recovery tape unit, or both, are incorrectly configured.												
O	Status of MAP Override (O = ON, blank - OFF)												
P	Type number (1 or 2)												
RRR	Bit rate (HBR, LBR, blank for IU)												
SSS	Source (TTY or HSP)												
V	Indicates which vehicle (1 or 2) has switched TLM bit rates												
VI	Verb initiate												
VV	Vehicle and number												
VVV	Vehicle (CSM, LM or SLV)												
X	Initialization phase 1 = Reinitialization (P = 4000) 2 = Restarting (P = 4010) 3 = Recycling (P = 4020)												
XXX	Telemetry Format change												
XXXX or ZZZ	CAM Number												
Y	Telemetry Indication <table><tr><td>2</td><td>RETRIEVE</td><td>REQUEST FROM MCC</td></tr><tr><td>3</td><td>RETRIEVE</td><td>REQUEST FROM GSFC</td></tr><tr><td>0</td><td>REPLACE</td><td>REQUEST FROM MCC</td></tr><tr><td>1</td><td>REPLACE</td><td>REQUEST FROM GSFC</td></tr></table>	2	RETRIEVE	REQUEST FROM MCC	3	RETRIEVE	REQUEST FROM GSFC	0	REPLACE	REQUEST FROM MCC	1	REPLACE	REQUEST FROM GSFC
2	RETRIEVE	REQUEST FROM MCC											
3	RETRIEVE	REQUEST FROM GSFC											
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ZZ	Type of error, see HSD errors												
ZZZZZ	Status data received from MTUs (bits 0 - 14).												

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b. High-speed Printer Messages. The following is a list of the high-speed printer messages:

Item No.	HSP Printout	Explanation
1	MODE 1 REQ	A 979 has been inserted to initiate the selection of the Mode 1 operation.*
2	CMD MODE 1	Mode 1 operation has been selected.
3	MODE 2 REQ	A 980 has been inserted to initiate the selection of the Mode 2 operation.*
4	CMD MODE 2	Mode 2 operation has been selected
5	F/C MODE REQ	A 977 has been inserted to initiate the selection of the Flight Controller Mode of operation.*
6	CMD F/C MODE	Flight Controller Mode of operation has been selected.
7	M/O MODE REQ	A 978 has been inserted to initiate the selection of the Maintenance and Operations Mode of operation.*
8	CMD M/O MODE	The Maintenance and Operations Mode of operation has been selected.
*The actual selection of the function has not been performed at this point; the entry has been validated as a legitimate CAM request.		

Item No.	HSP Printout	Explanation
9	LOAD ENABLE REQ	A 973 has been inserted to initiate the selection of the Load Enable Mode of operation.*
10	CMD LOAD ENABLE	The Load Enable Mode of operation has been selected.
11	LOAD DISABLE REQ	A 974 has been inserted to initiate the selection of the Load Disable Mode of operation.*
12	CMD LOAD DISABLE	The Load Disable Mode of operation has been selected.
13	VEHICLE 1 REQ	A 970 has been inserted to initiate the selection of vehicle number one (i.e. CSM 1, LM 1, or SLV 1) for uplink purposes.*
14	VEHICLE 1 SELECTED	Vehicle number one (CSM 1, LM 1, or S-IVB 1) has been selected for future uplink processing. The vehicle latch pushbuttons on the CAM, (CSM, LM, or SLV) will control the actual vehicle selected.
15	VEHICLE 2 REQ	A 971 has been inserted to initiate the selection of vehicle number two (i.e. CSM 2, LM 2, or SLV 2) for uplink purposes.*
16	VEHICLE 2 SELECTED	Vehicle number two (CSM 2, LM2, or SLV 2) has been selected for future uplink processing. The vehicle latch buttons on the CAM (CSM, LM, or SLV) will control the actual vehicle selected.
17	USB CARRIER REQ	A 986 has been inserted to initiate the selection of the USB carrier for uplink purposes.*
*The actual selection of the function has not been performed at this point; the entry has been validated as a legitimate CAM request.		

Item No.	HSP Printout	Explanation
18	USB CARRIER SELECTED	The USB carrier has been selected for use in future uplink processing. This selection causes no actual UDB activity to be performed.
19	MAP OVRD ON REQ	A 983 has been inserted to initiate the selection of the MAP override mode for uplink purposes.*
20	MAP OVERRIDE ON	The MAP override mode has been selected for future uplink processing.
21	MAP OVRD OFF REQ	A 984 has been inserted to initiate the inhibition of the MAP override mode for uplink purposes.*
22	MAP OVERRIDE OFF	The MAP override mode has been inhibited for future uplink processing.**
23	STATUS TEST REQ USB	A 988 has been inserted to initiate a status test on the USB transmission system.*
24	UDB STATUS OK	On status test request verifies the RF return (status-data) is good for the requested carrier.
25	UDB STATUS BAD	On status test request indicates that RF return (status-data) fails status and/or data checks for the requested carrier.
26	CH CSM 1	Data retrieval processing has begun on a CSM type I HSP or TTY command history.
27	CH CSM 2	Data retrieval processing has begun on a CSM type II HSP or TTY command history.
28	CH LM 1	Data retrieval processing has begun on an LM type I HSP or TTY command history.
29	CH LM 2	Data retrieval processing has begun on an LM type II HSP or TTY command history.
30	CH SLV 1	Data retrieval processing has begun on an SLV type I HSP or TTY command history.
31	CH SLV 2	Data retrieval processing has begun on an SLV type II HSP or TTY command history.
32	CMDH EOF REQ	A 996 has been inserted to initiate the recording of an end of pass identifier.*
<p>*The actual selection of the function has not been performed at this point; the entry has been validated as a legitimate CAM request.</p> <p>**Has no effect on CMC/LGC VI and LI uplinks, which go with automatic MAP override.</p>		

Item No.	HSP Printout	Explanation
33	CMDH EOF	The processing is in progress to record an end-of-pass identifier on the command history tape (three tape marks).
34	LOAD INV HSP REQ	A 982 has been inserted to initiate a load inventory printout on the HSP.*
35	LOAD INV TTY REQ	A 981 has been inserted to initiate a load inventory summary on the TTY.*
36	INV SUM IN PROGRESS	A load inventory summary is in progress on the TTY.
37	CMD PARAM LIST REQ	A 990 has been inserted to initiate a command parameter listing printout on the HSP.*
38	TEMP LOAD CLEAR REQ	A 975 has been inserted to initiate the clearing of a temporary load.*
39	LOAD LLDD TEMP CLEAR	Load LLDD has been cleared from temporary storage as the result of a CAM or HSD initiated temporary load clear request.
40	RTC XXXX NOT FOUND	An RTC has been selected for future uplink or review, and has not been found legally selected and available in core.
41	LOAD LLDD NOT FOUND	A load has been selected for future uplink, review, compare, or load clear, and has not been found legally selected and available in core.
42	UPL EEEEEEEEEEE CCC YYY O	An uplink of an RTC is in progress.
43	UPL VI LLDD CCC YYY O	An uplink of the verb preamble of a CMC or LGC load is in progress.
44	UPL LI LLDD CCC YYY O	An uplink of the load data of a CMC, LGC or SLV load is in progress.
45	UPL LL LLDD CCC YYY O	An uplink of a line-by-line correction of a CMC or LGC load is in progress.
46	CMD LLDD (or XXXX) VERIFIED	An RTC, SLV load, or verb initiate has been verified by MAPs from a spacecraft vehicle or the command has been uplinked in the MAP override mode. This printout will not occur on the uplink of the load data of a CMC or LGC load or on the uplink of a line-by-line correction of a CSM or LM load.
*The actual selection of the function has not been performed at this point; the entry has been validated as a legitimate CAM request.		

Item No.	HSP Printout	Explanation
47	CMD LLDD (or XXXX) S/C REJECT	The system has transmitted a command to a spacecraft vehicle the required number of times and has not received MAP verification from that vehicle. If the command is a priority command retransmission it will continue until either verification or termination occurs.
48	CMD LLDD (or XXXX) GND REJ Z	A ground rejection condition exists on the current uplink and all uplink activity has been terminated.
49	CMD TERMINATE REQ	A request has been received via the CAM to terminate an uplink or compare. The actual termination processing has not begun at this point. The entry has only been validated as a legitimate CAM request.
50	MANUAL CMD TERMINATE	A command terminate request has been received via the CAM or HSD lines and can legally be performed.
51	AUTO CMD TERMINATE	A legal request has been received via the CAM or HSD lines to uplink a priority command and an uplink or compare is in progress.
52	CMD XXXX TERMINATED	The uplink or compare processing which was in progress has been terminated as the result of a command terminate request or a request to uplink a priority command.
53	L/L CORRECTION REQ	A request has been received via CAM to perform a line-by-line correction on last CMC/LGC load uplink performed. The correction processing has not been performed at this point. The entry has only been validated as a legitimate CAM request.
54	COMPARE LLDD	Compare processing has begun on load LLDD as the result of either a CAM or HSD compare request of the automatic compare processing after an CMC/LGC load uplink or line-by-line correction uplink.
55	OK COMPARE LLDD	A comparison has been performed on load LLDD and no errors were detected.
56	COMP ERR 01 . . . 24	A comparison has been performed on load LLDD and errors were detected in lines 01.....24.

6ND
REJ

Item No.	HSP Printout	Explanation
57	COMPARE VALID	A comparison error has occurred, and the (uplink) state-buffer data used in the comparison was valid data.
58	COMPARE INVALID	A comparison error has occurred, and the state-buffer data used in the comparison was invalid data.
59	COMP ERR NO TLM	A comparison has been attempted but could not be performed because there was no high-bit rate telemetry available, or the downlist ID was incorrect.
60	LOAD LLDD CLEAR	Permanent load LLDD has been cleared from storage as the result of a CAM-or HSD-initiated load clear request.
61	HSD TLM FORMAT XXX Y	A TLM Format change CEF has been received via the HSD lines.
62	CANCEL CAM	The previous CAM request has been cancelled. This will not terminate a CAM-initiated function which is already in progress.
63	ILLEGAL CAM XXXX	The CAM entry is not a legitimate CAM function.
64	CMD XXXX ILL REQ	A legitimate function has been requested via the CAM but it cannot be performed because it has been found to be illegal. An example of this would be a request from the CAM to perform a compare while an uplink or compare was in progress.
65	HSD ERR ZZ LLDD	Input via the HSD lines has been found to be in error.
66	LAUNCH ABORT MILA	A launch-director abort has been received from the blockhouse.
67	MODE CONFIRMED	This printout will occur if the mode presently in effect is selected.
68	IC ENABLE	This message is output when a time-out has occurred and the command program has just received an external function from the telemetry program.
69	IC DISABLE	Command IC has attempted a transfer and has timed out. The timeout can be either a hardware timeout or a software timeout. Command IC will not attempt any further transfers (with the exception of periodic EFs) until an EF is received from the TLM IC.

Item No.	HSP Printout	Explanation
70	IC FAIL IC DATA LOSS	This message is output when a timeout has occurred and indicates a telemetry software or hardware problem.
71	CMD HISTORY ABORTED	This message is output if a history is in progress and the same history is again requested, or if uplinking overflows the history buffer during a history output.
72	NO CMD's XMITTED END OF HISTORY	This message is output if a history is requested and no CMD's are transmitted.
73	BAD TAPE RECORD	This message is output if a history is requested and previous history write functions were unsuccessful.
74	INV SUM COMPLETED	A TTY load inventory summary is completed.
75	IC RCVE ERR XXXX	<p>a. XXXX = PRTY An EF has been received from the TLM computer that did not have odd parity.</p> <p>b. XXXX = OVFL An EF has been received from the TLM computer that indicated an input buffer in CMD was needed</p>
76	IC XXX XMIT FAIL	<p>a. XXX = CAP Command IC has transmitted a CAP twice and has received no verification from TLM. The data is lost.</p> <p>b. XXX = LOT Same as above but for LOT data.</p> <p>c. XXX = CEF Same as above but for TLM format change data.</p>
77	CTE UPL ENABLED	The GMT data input is error free and an accurate CTE is being calculated. Uplinking is enabled for CTE.
78	CTE UPL DISABLED	The GMT data input has been in error 10 times in the last 30 seconds; therefore, CTE uplinking has been disabled.
79	PCM BIT-18 SET	This message is printed if a marginal data bit 18 is sensed in the TLM stream when a MAP, CRP, AVP, or CMC/LGC downlist is being processed.

Item No.	HSP Printout	Explanation
80	INIT PHASE X	<p>This message indicates from what phase the program was initialized. The message appears in the CMD parameter listing, second line.</p> <p>X = 1 - reinitialization P = 4000 2 - restarting P = 4001 4010 3 - recycling P = 4002 4020</p>
81	GCA STATUS AA	<p>This message now appears with a load acceptance or load clear message.</p> <p>AA = available slots in GCA</p>
82	CMDH VVV SSS TP REQ	<p>Replaces HSP message CMDH XXX REQ for a history request on the first sequence.</p> <p>VVV = CSM, SLV, or LM SSS = HSP or TTY P = Type (1 or 2)</p>
83	RTC ZZZ VV JJJ REQ	<p>Replaces HSP message CAM XXXX. Ready for an RTC request on the first sequence.</p> <p>ZZZ = CAM number VV = Vehicle and number JJJ = UPL or REV</p>
84	LOAD LLDD VV FFF REQ	<p>Replaces HSP message LOAD LLDD READY for a load request on the first sequence.</p> <p>LLDD = Load and sequence No. VV = Vehicle and number FFF = UPL, REV, CMP, or CLR</p>

 PDC #
5

Item No.	HSP Printout					Explanation									
88	An example of command parameter listing high-speed printout is as follows:														
COMMAND PARAMETER LISTING					XX:XX:XX:XX:					XXX:XX:XX					
SYS	CMD	NCG	724	MIS	1	STA	71	INIT PHASE 1							
GMT	69														
LOT	69	11	11	11	11	11	UPDATED SITE								
RTN	3	CTE	0	BFD	02	CMS	02								
VEH	MWP	MBP	VAD	SYSADD	A	B	C	D	E	F	G	H	DECODER	SBC	
C1	0360	120	4	0 * * 3 4 5 6 7											A
TST A 140															
TST B 220															
C2	****	***	*	* * * * * * * *											*
TST A ***															
TST B ***															
L1	0500	133	3	* 1 4 5 * *											A
TST 104															
L2	****	***	*	* * * * * * * *											*
TST ***															
S1	0250	7		25367										A	
S2	****	*		*****										*	
Mode 2	F/C	LOAD ENABLE OVRD OFF USB VEH 1 ΔCAP 2000													

Note

Δ CAP is a variable number dependent upon the high-speed output rate and data line available.

c. High-speed Error Messages. High-speed printouts from the Universal Command System describing errors in a high-speed load or command execute are listed in numerical sequence.

Error Type	MCC Input	Error Condition	HSP Printout	MCC Indication
01	Introductory sub-block 1 RTC/computer function execute requests. Load execute requests. Load clear requests. Compare requests. Line-by-line requests.	Wrong site ID	HSD LLDD ERROR 01 or HSD ZZZ ERROR 01	NO CAP
02	All inputs	PEP failure	HSD LLDD ERROR 02 or HSD ZZZ ERROR 02	NO CAP
03	RTC execute requests. Load execute requests. Load clear requests. Command terminate requests. Compare requests. Line-by-line requests	Not in mode 2	HSD LLDD ERROR 03 or HSD ZZZ ERROR 03	NONVAL CAP
04	RTC/computer function execute requests. Load execute requests. Compare requests. Line-by-line requests	The CAM number is undefined. The load is not in permanent storage	HSD LLDD ERROR 04 or HSD ZZZ ERROR 04	NONVAL CAP
05	RTC execute requests. Load execute requests. Load clear requests. Compare requests. Line-by-line requests. Command history requests. Load inventory requests. Site/carrier status requests	An uplink, compare or line-by-line correction is in progress	HSD LLDD ERROR 05 or HSD ZZZ ERROR 05	NONVAL CAP
06	Load clear requests	The load is not in permanent or temporary storage	HSD LLDD ERROR 06	NONVAL CAP

Error Type	MCC Input	Error Condition	HSP Printout	MCC Indication
07	Command terminate requests	There is no up-link, compare, or line-by-line correction in progress	HSD ZZZ ERROR 07	NONVAL CAP
08	Command history requests	A command history is in progress which was initiated by MCC, but it is not the same type as the one requested.	HSD ZZZ ERROR 08	NONVAL CAP
09	Introductory sub-block II RTC execute requests	Illegal Vehicle ID	HSD LLDD ERROR 09 or HSD ZZZ ERROR 09	NO CAP
10	Line-by-line requests	The load is not the last CMC or LGC load upon which a comparison error occurred	HSD LLDD ERROR 10	NONVAL CAP
11	All inputs	Wrong mission number	HSD LLDD ERROR 11 or HSD ZZZ ERROR 11	NO CAP
12	RTC/computer function execute requests. Load type execute functions (introductory field equals 01)	Undefined function code A verb initiate, compare or line-by-line request is made for a SLV load	HSD ERROR 12 or HSD ZZZ ERROR 12	NONVAL CAP
13	HSD/TTY loads	Bad sub-block count	HSD LLDD ERROR 13	NO CAP
14	HSD/TTY loads	Sub-blocks out of sequence	HSD LLDD ERROR 14	NO CAP
15	HSD/TTY load	Bad data word count	HSD LLDD ERROR 15	NO CAP
16	HSD/TTY CMC/LGC loads	Illegal keycode	HSD LLDD ERROR 16	NO CAP
17	HSD/TTY GMTLO loads	Invalid GMTLO data	HSD LLDD ERROR 17	NO CAP

Error Type	MCC Input	Error Condition	HSP Printout	MCC Indication
18	HSD/TTY loads	Invalid load type	HSD LLDD ERROR 18	NONVAL CAP
19	HSD/TTY loads	The load is already in temporary or permanent storage	HSD LLDD ERROR 19	NONVAL CAP
20	HSD/TTY loads	Permanent storage is full in LOAD ENABLE Mode or temporary storage is occupied in LOAD DISABLE Mode.	HSD LLDD ERROR 20	NONVAL CAP
21	HSD/TTY loads	Load length exceeds maximum allowable length for regular (20 line) storage and special (100 line) storage is occupied	HSD LLDD ERROR 21	NONVAL CAP
22	HSD/TTY loads	Load length exceeds maximum allowable length	HSD LLDD ERROR 22	NONVAL CAP
23		Undefined		
24	Load Execute Request	Load requested for uplink is in temporary storage	HSD LLDD ERROR 24	NONVAL CAP
25	Command History Requests	MCC request for history, made while a CAM initiated history is in progress, has not yet been honored.	HSD ZZZ ERROR 25	NONVAL CAP
26	RTC Execute Requests	GMT disables; CTE uplink inhibited	HSD ZZZ ERROR 26	NONVAL CAP
27	Buffer Compare Requests	Low bit rate TLM for CMC/LGC load compare request	HSD LLDD ERROR 27	NONVAL CAP
28	RTC Execute Requests	Attempt to uplink a spare RTC	HSD ZZZ ERROR 28	NONVAL CAP

Error Type	MCC Input	Error Condition	HPS Printout	MCC Indication
30	Command History Request	Previous history request has not been honored due to tape rewinding or tape unit malfunction	HSD ZZZ ERROR 30	NONVAL CAP

d. Command CAM Error Messages. High-speed printouts from the universal command system program describing errors resulting from a command CAM request are printed as a standard error message:

CAM XXXX (or ZZZ) ERROR QQ

The definitions of QQ are as follows:

- 00 - Undefined
- 01 - Undefined
- 02 - Vehicle 1 or 2 not selected
- 03 - Not in Mode 1
- 04 - Load not in temporary storage for temporary load clear
- 05 - An uplink, compare, line-by-line correction, or station status test is in progress
- 06 - Undefined
- 07 - For a manual command terminate request there are no uplink, compare, or line-by-line corrections in progress
- 08 - The current CAM-initiated history request is not the same as the CAM-initiated history in progress
- 09 - Illegal vehicle ID
- 10 - For a line-by-line correction request, there is no CMC or LGC load which failed to compare
- 11 - MCC history is in progress
- 12 - Compare or line-by-line request for SLV load
- 13 thru 22 - Undefined
- 23 - Not in Flight Control Mode
- 24 - Load requested for uplink is in temporary storage

*STB
NFW
PAGE*

- 25 - Undefined
- 26 - GMT disabled, CTE uplink inhibited
- 27 - LBR data for a CSM load compare
- 28 - Uplink attempt of spare RTC
- 30 - History request cannot be honored while history tape is rewinding
- 66 - Illegal condition; possible hardware problems
- 71 - Momentaries are illegal
- 72 - "A" sequence is illegal (latching)
- 73 - "B" sequence is illegal
- 75 - Launch abort request format error
- 76 - Not in Mode 2 for launch abort

55.8 SPECIAL COMMAND INSTRUCTIONS

55.8.1 UPDATA BUFFER SAFING PROCEDURES

Whenever the M&O is notified by MCC or GSFC to safe the command system with command carriers on, he will press the OPERATE/SAFE switch on the M&O console and verify that the safe indicator lights red. This action inhibits all commanding via USB equipment that passes through the updata buffer. The following is printed out on the 1232 when the UDB is safed:

UDB XX ERROR YY

55.8.2 COMMAND HISTORY REDUCTION AT MIL

MIL will provide real-time command reduction of transmissions from the MIL USB system for the Countdown Demonstration Test (CDDT), the Flight Readiness Test (FRT) and the MCC/MIL command readiness test and plugs-in and plugs-out testing. Those commands monitored by the MIL USB receiver will be reduced by the MIL 1218 computer using the command analysis reduction program. MIL will also record the USB signal on the wideband recorder for later data reduction as required.

"DCS RED" SEE MIL KIL 1 AAS.

- 25 - Undefined
- 26 - GMT disabled, CTE uplink inhibited
- 27 - LBR data for a CSM load compare
- 28 - Uplink attempt of spare RTC
- 30 - History request cannot be honored while history tape is rewinding
- 66 - Illegal condition; possible hardware problems
- 71 - Momentaries are illegal
- 72 - "A" sequence is illegal (latching)
- 73 - "B" sequence is illegal
- 75 - Launch abort request format error
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55.8 SPECIAL COMMAND INSTRUCTIONS

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181
78 ! 55.8.3 NOT APPLICABLE TO HSK

55.9 642B SYSTEMS TAPE OPERATION

55.9.1 EQUIPMENT PREPARATION

55.9.1.1 To Clear Core on Both 642B Computers

- a. Set B7 to DISCONNECT. All other PROGRAM JUMP, STOP, and DISCONNECT switches down.
- b. Set BOOTSTRAP PROGRAM switch to I
- c. Press LOAD pushbutton
- d. Press START STEP switch
- e. Set bit 18 in the U register
- f. Clear the Q register.
- g. Set ADDRESS MODE switch up (17-bit mode)
- h. Press 17-bit ADDRESS MODE PBI (to clear EMU)
- i. Press OP STEP pushbutton
- j. Press MASTER CLEAR pushbutton.

55.9.1.2 To Initially Configure the 642B Computer

- a. Set AUTOMATIC RECOVERY switch down
- b. Set all PROGRAM JUMP, STOP, and DISCONNECT switches down.

Note

1. Prior to mounting any magnetic tape, clean the read/write heads.
2. The command tape handlers must not be disturbed once the program has written onto these tapes.

55.9.1.3 To Prepare Telemetry Magnetic Tape Unit, Channel 6

- a. Mount the NCG-XXX systems telemetry format tape at beginning of tape (BOT) on handler No. 1
- b. Mount a scratch tape to be called Fault Dump/Recovery at BOT on handler No. 2
- c. On the tape control unit
 - (1) Press MASTER CLEAR pushbutton
 - (2) Set MODE switch to T1

(3) Set CLOCK CONTROL to NORMAL.

d. On tape handler No. 1:

(1) Set three-way MAN/OFF/AUTO switch to AUTO

(2) Set ADDRESS switch to 1 (systems tape).

e. On tape handler No. 2:

(1) Set three-way MAN/OFF/AUTO switch to AUTO

(2) Set ADDRESS switch to 2 (Fault Dump/Recovery tape).

f. Indicator light status on telemetry handlers

WRITE ENABLE (HANDLER 1) off

WRITE ENABLE (HANDLER 2) on

SELECT--off

REWIND--off

REV-----off

FWD-----off

EOT-----off

BOT-----on

READY---off

55.9.1.4 To Prepare Command Magnetic Tape Unit, Channel 11

a. Mount a scratch tape (to be called "recovery") at BOT on tape handler No. 1

b. Mount a scratch tape (to be called "history") at BOT on tape handler No. 2

c. On tape control unit:

(1) Set MODE switch to T1

(2) Set CLOCK CONTROL to NORMAL

(3) Press MASTER CLEAR.

d. On tape handler No. 1:

(1) Set three-way MAN/OFF/AUTO switch to AUTO

(2) Set ADDRESS switch to 1 (recovery).

e. On tape handler No. 2:

- (1) Set three-way MAN/OFF/AUTO switch to AUTO
- (2) Set ADDRESS switch to 2 (history).

f. Indicator lights status on both command handlers

WRITE ENABLE -----on
SELECT-----off
REWIND-----off
REV-----off
FWD----- off
EOT-----off
BOT-----on
READY-----off

55.9.2 PROGRAM LOADING

55.9.2.1 To Load the Resident Control Program Expanded Memory Unit (RCPEMU)

a. From magnetic tape (prime):

- (1) Set BOOTSTRAP PROGRAM switch to II
- (2) Press LOAD pushbutton
- (3) Set EI INH on all channels; hold EMU EI INH until control is transferred to RCP
- (4) Press START STEP switch
- (5) Proceed to paragraph c.

b. From paper tape (backup):

- (1) The 1232 Tape Reader will be mounted with either:
 - (a) RCPEMU Channel 6 paper tape program when the systems tape is mounted on the TMP MTU, or
 - (b) The RCPEMU Channel 11 program when the systems tape is mounted on the CMP MTU.
- (2) Press LOAD pushbutton
- (3) Set EI INH on all channels, hold EMU EI INH until control is transferred to RCP
- (4) Press START STEP switch
- (5) Proceed to paragraph c.

- c. The RCPEMU program will request the computer tech to type:

CMD ☐ , EMOD ☐ , TLM ☐ , or OUCH ☐ for input.

- d. The computer tech shall type in PPP (the desired program) and press SPEC key. Spaces are ignored and a RETURN line feed will allow the operator to begin retyping.

- e. The RCPEMU program will cause the 1232 to print out:

NCG XXX-YY,-DA, MO, YR

where: XXX = NCG number

YY = Level of program

DA, MO, YR = Day, month, and year the program was compiled.

- f. The selected program will be read from the systems mag tape into core memory. The 1232 will printout:

PPP LOADED.

The computer will 4-stop. If problems exist in starting RCPEMU, it can be recycled at 000701₈

- g. Proceed to load errata tape. When no errata are available, press START STEP switch and proceed to program initialization (CMD, TLM, or EMOD).

55.9.2.2 To Load Errata Tapes for the NCG-XXX Systems Tape

Note

1. Errata tapes must be loaded in numerical sequence.
 2. A successful errata load will be indicated by a 4-stop, a bad errata load is indicated with Q and A not equal to "0".
- a. Place errata tape in tape reader
 - b. Set BOOTSTRAP PROGRAM switch to I
 - c. Press OP STEP pushbutton
 - d. Press MASTER CLEAR pushbutton
 - e. Set EI INH on all channels including EMU
 - f. Set the P register to 2₈ and set the Q register to 1000000000₈
 - g. Press RUN pushbutton
 - h. Press START STEP switch
 - i. RCPEMU will read in errata tape and 4-stop
 - j. Place next errata tape in reader. Press START STEP switch.

k. Repeat step j until all errata are loaded

l. Proceed to program initialization, COMMAND TELEMETRY or EMOD.

55.9.3 COMMAND PROGRAM OPERATIONS

55.9.3.1 To Initialize the Command Program

Note

During command program initialization an option exists to save data on the command recovery tape (JUMP key 2 down) or to discard the command recovery data and write a new CBARF image (JUMP key 2 up). When initiating the program for the first time JUMP key 2 must be up for the program to write a new Common Command Data Pool (CCDP) image and to ensure all loads are cleared. Set STOP key 5 up if a 5-stop is desired after each data processing checksum error. Do not set STOP key 5 unless directed by GSFC or MCC. This sequence of events is illustrated in figure 55-3.

a. Press OP STEP pushbutton

b. Press MASTER CLEAR pushbutton, AND "TEST ATTBI-A1" (ALSO TRUE FOR RESTART & RECYCLE) PDC #5

c. Set the P register to 4000₈

I.E. INT. ENABLE PBI

d. Press RUN pushbutton

e. Press START STEP switch

f. If the program types:

17 BIT MODE ERR

set PROGRAM MODE switch up and press START STEP switch

g. If the program types:

B7 DISCONNECTED

connect B7 switch and press START STEP switch

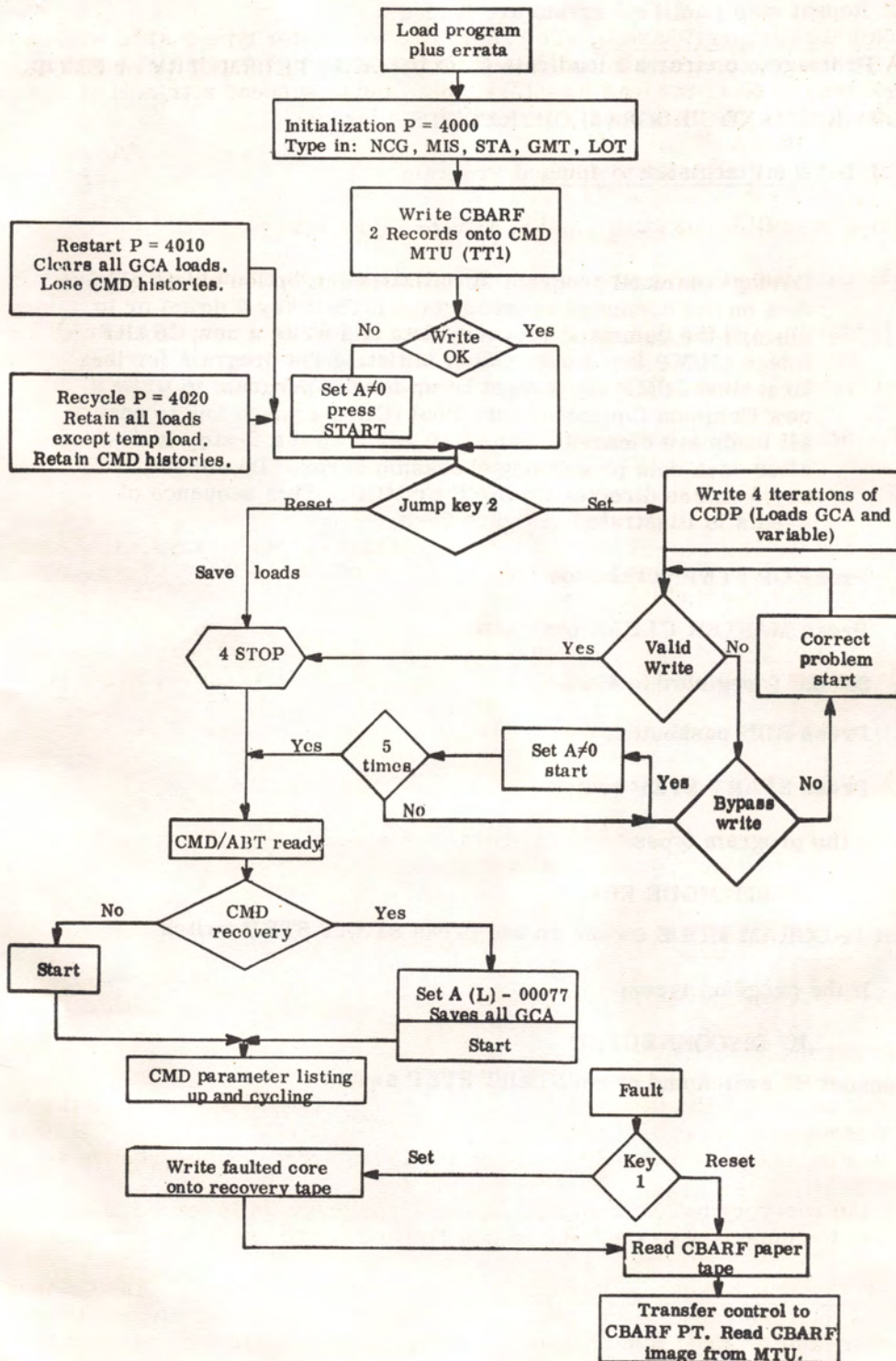


Figure 55-3. Command Program

AS-506 Supplements to NOD

h. If the program types:

RTC DISCONNECTED

connect RTC switch and press START STEP switch

i. If the program types:

BOOT I DISCONNECTED

set BOOTSTRAP I and press START STEP switch

j. 1232 types:

INITIATION - CMD

SYS, XXX, ↑

SYS,

k. Operator types:

CMD, ↑ (Normal Command)

ABT, ↑ (Abort Launch Capability - MIL only)

l. 1232 types:

NCG, XXX, ↑

NCG,

m. Operator types:

NNN, ↑ (NNN - NCG 3-digit number)

n. 1232 types:

MIS, X, ↑

MIS,

o. Operator types:

PDC # / 12 ↑

p. 1232 types:

STA, XX, ↑

STA,

q. Operator types:

XX, (Station ID - 2 digits. Refer to Section 55 of NOD)

r. 1232 types:

GMT, YR, †

GMT,

s. Operator types:

(year - 2 digits), †

t. 1232 types:

LOT, YR, MO, DA, HR, MN, SEC, †

LOT,

u. Operator types:

(year - 2 digits), (month - 2 digits),

(day - 2 digits), (hour - 2 digits),

(minute - 2 digits), (second - 2 digits), †

v. 1232 types:

CMD READY or ABT READY

w. The program rewinds the recovery tape and writes 2 iterations of main frame and EMU core (CBARF image). If the CBARF write operation is unsuccessful, the program will type out:

TYPE N MTU ERR ZZZZZ

Refer to UCATS for an explanation of errors and corrective actions. If desired, press START STEP switch to attempt to write 2 iterations again. Whenever corrective action fails, set A register not equal to zero and press START switch. This causes the program to bypass the CBARF WRITE.

x. If the CBARF WRITE operation was successful or if the program was forced to bypass errors, the setting of JUMP key 2 will be sensed. If JUMP key 2 is in the up position, a fresh tape is assumed to be mounted on the command recovery handler. The program will write four iterations of the CCDP on the command recovery tape and position it for subsequent command recovery operations. If the CCDP write operation is unsuccessful, the program will type out:

TYPE N MTU ERR ZZZZZ

Refer to UCATS for an explanation of errors and corrective actions.

y. If JUMP key 2 was down or if the program was forced to bypass errors, the program will 4-stop, allowing a command recovery option. Refer to paragraph 55.9.3.3. for command recovery.

- z. Reset JUMP key 2 after the CBARF image is written
- aa. Mount the CBARF paper tape in the 1232 reader
- ab. Set the automatic recovery switch up. Do not set JUMP key 1 up unless directed by MCC or GSFC.
- ac. When the command program is cycling, the M&O will select M&O mode and instruct the computer technician to insert the following via the I/O routine:

Vehicle	SBC	MWP
C1	C	275 Ms
L1	C	275 Ms
S1	C	275 Ms

- ad. At approximately TLI + 50 minutes, upon direction from the NC, configure the command program as follows:

Vehicle	MWP
C1	2.8 Sec
L1	2.8 Sec
S1	500 Ms

- ae. At approximately TLI + 3 hours, upon direction from the NC, change the SLV MWP to 750 milliseconds.
- af. At approximately TLI + 10 hours, upon direction from the NC, change the CSM, LM, and SLV RTN to 0.

NOTE:

IF IT IS DESIRED TO REINITIALIZE, RESTART OR RECYCLE THE COMMAND PROGRAM, SET STOP KEY 7 TO BRING THE PROGRAM TO AN ORDERLY STOP. RESET THE KEY AND PROCEED.

7DC# 11

55.9.3.2 Command Restarting

a. Reinitialization (Phase I). To reinitialize parameter type-ins, to write a new CBARF image, to clear all load data from the GCA, to setup initial interrupt addresses, to clear the load inventory table, and to suspend retrieval of command history (unless OUCH is used), perform the following:

- (1) Set the P register to 4000_8
- (2) Press RUN pushbutton and START STEP switch
- (3) Continue at paragraph 55.9.3.1f initializing command program.

b. Restarting (Phase II). To restart, bypassing initialization, to clear all loads from the GCA, to clear the load inventory table, and to suspend retrieval of command history (unless OUCH is used), perform the following:

- (1) Set the P register to 4010_8
- (2) Press RUN pushbutton and START STEP switch
- (3) The program will 4-stop, allowing a command recovery option. Refer to paragraph 55.9.3.3 for a command recovery option. To bypass recovery, press START STEP switch.

c. Recycling (Phase III). To recycle, bypassing reinitialization, to retain all loads (except temp loads) and command histories, perform the following:

- (1) Set the P register to 4020_8
- (2) Press RUN pushbutton and START STEP switch
- (3) The program will 4-stop, allowing a command recovery option by performing command recovery, refer to paragraph 55.9.3.3. To bypass recovery, press START STEP switch.

55.9.3.3 Command Recovery

- a. Set the A register to 77_8
- b. Press the START STEP switch
- c. The program will attempt to read in the command recovery data. If the attempt is unsuccessful, the program will type out: TYPE N MTU ERR ZZZZZ and come to a 4-stop. Refer to UCATS for an explanation of errors and corrective actions.
- d. If the recovery option is successful, or if the program is forced to bypass errors, the command system should now be cycling and ready for operation.

55.9.3.4 Command Backup Automatic Recovery Feature (CBARF). The CBARF minimizes the time required to reload and restart the command system in the event of a computer fault or EMU hold time-out interrupt. CBARF will be exercised automatically in the event of a computer fault or EMU hold time-out interrupt or may be manually initiated. The program offers the option of obtaining a dump at the time of the fault and reload of the command system, or only a reload. Operating instructions are contained in SCAN.

55.9.4 TELEMETRY PROGRAM OPERATIONS

55.9.4.1 Telemetry Initialization. To initialize the telemetry program, perform the following:

- a. Press OP STEP pushbutton
- b. Press MASTER CLEAR pushbutton, AND "TEST A7TB1-A1" (ALSO TRUE FOR PDC
RESTART & RECYCLE) "S"
- c. Set the P register to 4000₈
- d. Press RUN pushbutton
- e. Press START STEP switch
- f. Check the following settings if the program 4-stops and the 1232 prints:

ILLEGAL KEY SETTING

- (1) JUMP key 2 and/or 3 should be down
- (2) ADDRESS MODE switch should be up (no 1232 I/O printout)
- (3) B7 DISCONNECT switch should be down
- (4) RTC DISCONNECT switch should be down
- (5) OVERLAP should be down
- (6) BOOTSTRAP switch should be set to I.

Note

Figure 55-4 illustrates the sequence of events of the telemetry program.

- g. If the program 5-, 6-, or 7-stops, reset the corresponding STOP key
- h. The 1232 types:

INITIATION - TLM
NCG, XXX, ↑
NCG,

- i. The operator types:

NNN, ↑ (NCG 3-digit number)

- j. The 1232 types:

MIS, X, ↑
MIS,

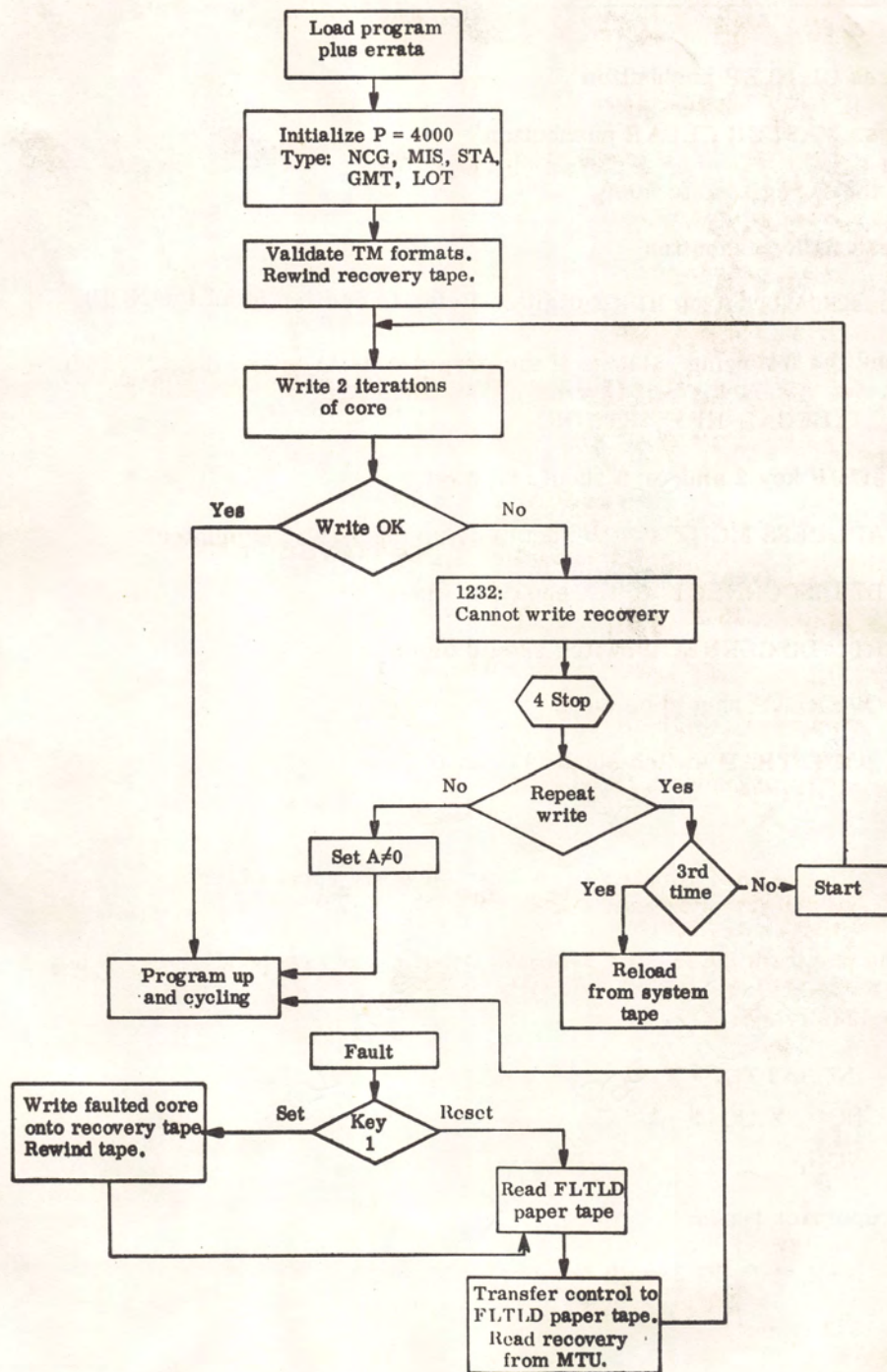


Figure 55-4. Telemetry Program.

k. The operator types:

PDC#1 14†

l. The 1232 types:

STA, XX, †

STA,

m. The operator types:

XX, † (Station ID - 2 digits. Refer to Section 55 of the NOD)

n. The 1232 types:

GMT, YR, †

GMT,

o. The operator types:

XX, † (year - 2 digits)

- p. The 1232 types:

LOT, YR, MO, DA, HR, MN, SEC, ↑
LOT,

- q. The operator types:

XX, XX, XX, XX, XX, XX, ↑ (year - 2 digits, month - 2 digits,
day - 2 digits, hour - 2 digits, minute - 2 digits, second - 2 digits.)

- r. The 1232 types:

TLM READY

- s. Once LOT has been inserted during TLM program initialization, the telemetry program will validate each high-speed format on the systems tapes, rewind the fault recovery tape, and write out two iterations of main frame and EMU core. The program will then print out the following on the 1232 and high-speed printers:

(1) 1232 Printout

ALL FORMATS ON ALL ITERATIONS GOOD
DES, D
MTB, B
HSD FMTS AAA BBB OUTPUT: CCC PRESELECTED
SLV PRIME I

(2) High-speed Printout

TLM ALL FORMATS ON ALL ITERATIONS GOOD
TLM DES D
TLM M/T B
TLM HSD FMTS AAA BBB OUTPUT:
CCC PRESELECTED
TLM SLV PRIME I

Note

The underscores within the examples of the telemetry program's 1232 and HSP printouts do not exist but they do designate symbols explained in the MSFN UCAT.

- t. If the recovery-write operations were unsuccessful, the 1232 will print:

CANNOT WRITE RECOVERY

The program will then 4-stop. At this time, if the START STEP switch is pressed, the recovery-write operation will be repeated. If desired to bypass the

unsuccessful recovery-write operation, set the A register not equal to 0 and press the START STEP switch. Thereafter, whenever the TLM computer faults, there will not be a recovery-read operation and the computer will 4-stop necessitating a complete reload.

u. Mount the fault load program FLTLD in the 1232 reader as one continuous loop.

v. Do not set JUMP key 1 on the TLM computer unless directed by MCC or GSFC. JUMP key 1 will normally be used during the NRT and premission period when a fault condition is experienced and further information is needed to isolate the problem.

55.9.4.2 Telemetry Restarting. If it is desired to reinitialize, restart, or recyle the telemetry program, set STOP key 7 to bring the program to an orderly stop. Reset the key and proceed.

a. Reinitialization (Phase I). To reinitialize parameter type-ins, to check the high-speed format tape, and to write a new Fault Dump Recovery, perform the following:

- (1) Set the P register to 4000₈
- (2) Press RUN pushbutton and START STEP switch
- (3) Continue at paragraph 55.9.4.1 f to initialize the telemetry program.

b. Restarting (Phase II). To bypass initialization, to setup the interrupt entrances, and to retain formats in core, perform the following:

- (1) Set the P register to 4010₈
- (2) Press RUN pushbutton and START STEP switch
- (3) The program will print out the following on the 1232 and the high-speed printer:

(a) High Speed Printout

TLM ALL FORMATS ON ALL
ITERATIONS GOOD
TLM NCG NNN
TLM MIS X
TLM STA XX
TLM GMT YR MO DA HR
TLM LOT YR MO DA HR MN SC
TLM DES D
TLM M/T B

TLM HSD FMTS AAA BBB OUTPUT
CCC PRESELECTED
 TLM SLV PRIME I

(b) 1232 Printout

ALL FORMATS ON ALL ITERATIONS GOOD
 NCG, NNN
 MIS, X
 STA, XX
 GMT, YR
 LOT, YR MO DA HR MN SC
 MTB, B
 HSD FMTS AAA, BBB OUTPUT; CCC PRESELECTED
 SLV PRIME I

c. Recycling (Phase III). To recycle user tables and exclude the parameter listing, perform the following:

- (1) Set the P register to 4020₈
- (2) Press RUN pushbutton and START STEP switch.

55.9.4.3 Telemetry Fault Load Program (FLTLD). The FLTLD minimizes the time required to reload and restart the telemetry system in the event of a computer fault or EMU hold time-out interrupt. The program effectively dumps core and all possible registers at the time of fault and reloads the telemetry program. Operating instructions are contained in SCAN.

55.9.5 EMOD PROGRAM OPERATIONS

55.9.5.1 To Initialize the EMOD Program

- a. Press OP STEP pushbutton
- b. Press the MASTER CLEAR pushbutton, AND "TEST A7TB1-A1" (ALSO TRUE FOR PDC # 5 RESTART AND RECYCLE)
- c. Set the P register to 4000₈
- d. Press RUN pushbutton, verify 17-bit mode switch is up
- e. Press START STEP switch
- f. 1232 types:

INITIATION - EMOD
 NCG, XXX,
 NCG,

g. Operator types:

NNN, ↑ (NNN - NCG 3-digit number)

h. 1232 types:

MIS, X, ↑

MIS,

i. Operator types:

PDC#1 12, ↑

j. 1232 types:

STA, XX, ↑

STA,

k. Operator types:

XX, ↑ (Station ID - 2 digits. Refer to Section 55 of the NOD)

l. 1232 prints:

EMOD READY

m. The EMOD program is now ready to accept and validate EMOD TLM data

n. The PCM operator should rewind the EMOD tape and begin to input the data to the decom; the PRIORITY switch must be set on the decom. The EMOD program will output a data status message upon completion of the EMOD validation (reference NOD - EMOD high-speed messages).

Note

The EMOD program will 4-stop to indicate errors in hardware or operational configuration, e.g. PRIORITY switch on decom not set. Take necessary corrective action and press the START STEP switch.

o. If the EMOD processing did not validate and it is desired to try again, perform the following at the 1232 console:

(1) Press KEYBOARD and INTERRUPT pushbuttons

(2) Press RETURN

(3) Type: RXM, ↑

p. Once the EMOD dump has been validated, the program will be ready to transmit EMOD data (HSD format 012). Prior to the request to transmit, two options exist via the 1232 I/O type-ins. They are as follows:

(1) DES, D, ↑ where D = G for GSFC, H for Houston, or B for both

(2) MTB, B, ↑ where B = T for Test or M for Mission.

55.9.6.1 (ISI#2)

COMPUTER MEMORY DUMPS DURING MISSION PERIODS.

JUMP KEY 1 WILL ALWAYS BE UP ON THE CMD, TLM OR ALSEP PROGRAMS EXCEPT AS DIPPICED BELOW:

- A. LAUNCH THROUGH TRANSPOSITION, DOCKING AND LM EJECTION (TD PLUS E) ALL STATIONS WILL CONFIGURE FOR THE MINUS COUNT INTERFACE WITH JUMP KEY 1 DOWN. INSTRUCTIONS TO THIS EFFECT WILL BE INCLUDED IN THE TERMINAL COUNT BRIEFING MESSAGE AND IN ADDITION, NETWORK WILL VERIFY EACH STATIONS CONFIGURATION AT THE COMPLETION OF EACH STATIONS INTERFACE PERIOD. AFTER COMPLETION OF A SUCCESSFUL (TD PLUS E) STATIONS WILL CONFIGURE WITH JUMP KEY 1 UP DURING THE H-70 COUNT FOR THE STATIONS NEXT VIEW PERIOD.
- B. LOI 1 THROUGH TEI. DESIGNATED PRIME (TWO-WAY) AND BACK-UP STATIONS WILL CONFIGURE WITH JUMP KEY 1 DOWN DURING EACH STATIONS'S H-70 COUNT. ALL OTHER STATIONS WILL CONFIGURE WITH JUMP KEY 1 UP. PRIOR TO POWER DESCENT INSERT (PDI), EVA AND ASCENT, NETWORK WILL VERIFY VERBALLY WITH THE PRIME AND BACKUP STATIONS TO INSURE PROPER CONFIGURATION.
- C. ENTRY - 4 HOURS THROUGH SPLASHDOWN. THE PRIME AND BACKUP STATIONS, PLUS THE REENTRY SHIP WILL BE CONFIGURED WITH JUMP KEY 1 DOWN.

Note

When either of these manual I/O routines have been initiated, they will be followed by one of the following printouts:

INPUT ERROR - START OVER

or

OK

q. The request to transmit may be initiated by one of the following methods:

(1) CAM: Press ^{STOP/START III}~~RETRIEVE 666~~ initiate PDC # 1

(2) 1232

(a) Press KEYBOARD and INTERRUPT pushbuttons

(b) Press RETURN

(c) Type: XMT, ↑

r. When transmission of format 12 (EMOD) begins, the following is printed on the high-speed printer:

HSD ON

s. Upon completion of a successful transmission, the following is printed on the high-speed printer:

HSD OFF

55.9.5.2 EMOD Restarting

a. To start after initialization:

(1) Press OP-STEP and MASTER CLEAR pushbuttons

(2) Set the P register to ~~10010~~ 4010₈ PDC # 1

(3) Press RUN pushbutton

(4) Press START STEP switch.

b. To restart from the 1232 console:

(1) Press KEYBOARD and INTERRUPT pushbuttons

(2) Press RETURN

(3) Type: RXM, ↑

5.9.6 CORE DUMPS (SEE PAGE 55-93) PDC # 5

55.10 KEY PROGRAM VERIFICATION ADDRESSES

The program parameter verification address for the manual I/O routines and the interrupt buffer locations are given in the following paragraphs.

55.10.1 COMMAND

55.10.1.1 Manual I/O Routine Addresses

<u>Manual I/O Routine</u>		<u>Address</u>
MWP	CSM 1	11210
	LM 1	11212
	SLV 1	11214
MBP	CSM 1	Test Word A 11101
		Test Word B 11102
		Valid Map 11103
	LM 1	DCA Test 11107
		Valid Map 11110
CMS		11113
SAD	CSM 1	Test Msg 11122
		CMC Words 11125
		CTE Update 11126
		RTC (Salvo-reset) 11127
		RTC (Int relay) 11130
LM 1	LGC words	11143
	A Decoder	11145 PDC # 1
	DCA Test Msg	11147
SLV 1		11206
CTE	ΔT	11077
LOT	(Sec, min, hr, day, mon, yr.)	17455-17462
BFD		11706 11076 PDC # 1
RTN		11075
VAD	CSM 1	11172
	LM 1	11170
	SLV 1	11200
SBC	CSM 1	11114
	LM 1	11116
	SLV 1	11120

55.10.1.2 Input Buffers Address

<u>Input Buffer</u>	<u>Address</u>
CAM	12624
High-speed input	32573
UDB input	34132 - 34136
UDB output	34670 - 34674

55.10.2 TELEMETRY

Table 55-5 lists the high-speed telemetry overhead words, the addresses to verify each word, and the variable contents.

55.10.2.1 Input Buffers Address

<u>Input Buffer</u>	<u>Address</u>
CAM	60116 - 60141
USB status	62546
AMQ	116156 - 116175
GMT R/T	60271 - 60316
GMT T/P	60316

TLM {

{ CSM ACC 116171
LM ACC 116172 }
CMO = 31612

PAM 1PAM 2

	<u>Buffer 1</u>	<u>Buffer 2</u>	<u>Buffer 1</u>	<u>Buffer 2</u>
PDC # 1	34071 - 34125 34072 - 34126	34126 - 34162 34127 - 34163	34000 - 34034	34035 - 34070 34071

55.10.2.2 Fault/Recycle Addresses

Fault address - to be supplied 277 AND 137
GMT of recycle - to be supplied 766

P4 of fault
PDC # 1 term of last 4020.

55.10.3 EMOD

Table 55-6 lists the EMOD program overhead words, the addresses to verify each word, and the variable contents.

Table 55-5. Telemetry Output Buffers

Ovhd Wd No.	Information	Line A		Line B		Contents
		Bfr 1 Adr	Bfr 2 Adr	Bfr 3 Adr	Bfr 4 Adr	
1	Sync	35305	35766	36447	37130	106
2	Sync	35306	35767	36450	37131	156
3	Sync	35307	35770	36451	37132	344
4	Source Code		35766 PDC# 11		PDC # 1 MIL A	MIL B MIL B MIL A Line A/B CYT-121/015 HAW-255/062 MAD-122/020 GYM-256/067 ETC-130/135 GDS-260/073 RED-242/124 TEX-263/076 CRO-244/025 HSK-247/026 MER-250/127 GWM-253/037
5	Destination Code					MSN1 046 GSFC only Houston only Both
6	TLM Format	35311	35772	36453	37134	MSN2 206 212 211 9 = 316 10 = 061 11 = 242 12 = 121 (EMOD) 13 = 020 14 = 004 15 = 010
7	Line Format Status	35312	35773	36454	37135	? = 320 3 = 002 4 = 205 5 = 127 6 = 111 7 = 233 8 = 034 2 ⁵ 1 = Mission 2 ⁶ 1 = LOS T 2 ⁷ 1 = LFI 0 = Test 0 = No LOS T 0 = No LFI

Table 55-5. Telemetry Output Buffers (cont)

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NFW
PAGE

Table 55-5. Telemetry Output Buffers (cont)

Ovhd Wd No.	Information	Line A			Line B			Contents
		Bfr 1 Adr	Bfr 2 Adr	Bfr 3 Adr	Bfr 4 Adr	Bfr 5 Adr	Bfr 6 Adr	
16	CAP	35324	36005	36466	37147			Bits 0 thru 7
17	CAP	35325	36006	36467	37150			Bits 8 thru 15
18	CAP	35326	36007	36470	37151			Bits 16 thru 23
19	CAP	35327	36010	36471	37152			Bits 24 thru 31
20	CAP	35330	36011	36472	37153			Bits 32 thru 39
21	Data in Con- secutive words	35331	36012	36473	37154			Data
25		35335	36016	36477	37160			
50		35366	36047	36530	37211			
75		35417	36100	36561	37242			
100		35450	36131	36612	37273			
125		35501	36163	36643	37324			
150		35532	36213	36674	37355			
175		35563	36244	36725	37406			
200		35614	36275	36756	37437			
225		35645	36326	37007	37470			
250	Frame Counter	35676	36357	37040	37521			Data Varies from 0 thru 11 _a
275		35727	36410	37071	37552			
299		35757	36440	37121	37602			
300		35760	36441	37122	37603			

Table 55-5. Telemetry Output Buffers (cont)

Ovhd Wd No.	Information	Line A		Line B		Contents
		Bfr 1 Adr	Bfr 2 Adr	Bfr 3 Adr	Bfr 4 Adr	
16	CAP	35324	36005	36466	37147	Bits 0 thru 7
17	CAP	35325	36006	36467	37150	Bits 8 thru 15
18	CAP	35326	36007	36470	37151	Bits 16 thru 23
19	CAP	35327	36010	36471	37152	Bits 24 thru 31
20	CAP	35330	36011	36472	37153	Bits 32 thru 39
21	Data in Con- secutive words	35331	36012	36473	37154	Data ↓ Data Varies from 0 thru 11 _a
25		35335	36016	36477	37160	
50		35366	36047	36530	37211	
75		35417	36100	36561	37242	
100		35450	36131	36612	37273	
125		35501	36162	36643	37324	
150		35532	36213	36674	37355	
175		35563	36244	36725	37406	
200		35614	36275	36756	37437	
225		35645	36326	37007	37470	
250	Frame Counter	35676	36357	37040	37521	
275		35727	36410	37071	37552	
299		35757	36440	37121	37602	
300		35760	36441	37122	37603	

Table 55-6. EMOD Program Output Buffers

Ovhd Wd No.	Information	Line A or B		Contents
		Bfr 1 Adr	Bfr 2 Adr	
1	SYNC	60236	60712	
12	EMOD STATUS	60251	60725	2^2 1 = Dump 0 = R/T 2^3 1 = HBR 0 = LBR 2^4 1 = R/T 0 = T/P 2^5 1 = Dynamic 0 = Static 2^6 1 = Live 0 = Fill 2^7 1 = LFI 0 = No LFI
29	First/Second	60272	60746	

FROM PAGE 55-87 (PDC # 5)

55.9.6 CORE DUMPS.

WHEN RUNNING WITH THE OPERATIONAL PROGRAMS (CMD, TLM OR ALSEP) SET JUMP KEY 1 UP TO INITIATE A CORE DUMP IN THE EVENT OF A PROGRAM FAULT. IN THE EVENT OF A PROGRAM LOOP, SINGLE STEP THROUGH THE LOOP WITH ALL INTERRUPTS LOCKED OUT. COPY THE "P" ADDRESSES THEN PRESS MASTER CLEAR, RUN AND START-STEP SWITCH TO FORCE A CORE DUMP. KEY 1 WILL ALWAYS BE UP UNLESS OTHERWISE DIRECTED OR IF THE STATION DETERMINES THE PROBLEM TO BE DEFINITELY HARDWARE AND A DUMP WOULD NOT BE BENEFICIAL. STATIONS ARE REQUESTED TO SAVE HSP, 1232 AND TTY PRINTOUTS, CMD HISTORY/RECOVERY MAGNETIC TAPES, AND ANALOG TAPES THAT ARE ASSOCIATED WITH THE PROBLEM. CORE DUMPS AND DATA OBTAINED WILL BE REQUESTED IN REAL TIME WHEN NECESSARY. IN THE EVENT THAT THIS DATE IS NOT REQUESTED WITHIN 5 DAYS, THE STATION MAY DISCARD THE DATA AT THEIR OPTION.

IF THE DUMP WAS PERFORMED ON THE SYSTEM RUNNING THE TLM PROGRAM INITIATE A LUK ROUTINE AFTER THE SYSTEM IS UP AND CYCLING AT ADDRESSES 5, 277, AND 300 AND RECORD CONTENTS IN THE COMMENT SECTION OF THE FAULT RECORD.

NOTE

WHEN REQUESTED BY NST/DATA THE DATA WILL BE SHIPPED IN ACCORDANCE WITH SECTION 35 OF THE NOD, ATTENTION CODE 813.1. ONCE THE PROGRAMMERS HAVE RECEIVED AND EVALUATED THE CORE DUMPS AND ASSOCIATED INFORMATION THE STATION WILL BE APPRAISED OF THE ANALYSIS RESULTS.

Supplement to Section 56

UHF Command

SECTION 56. UHF COMMAND

56.1 GENERAL

There are no UHF CMD requirements except for range safety support.

56.2 RANGE SAFETY SUPPORT

Range safety CMDs for the S-1C, S-II, and S-IVB during the launch phase will be via UHF only. The Range Safety Officer (RSO) at Cape Kennedy has control of commanding the CNV UHF transmitters via land lines and the GBI, ANT, or GTK UHF transmitters via the ETR subcable. By direction of the RSO, only one station will have the UHF CMD carrier on at any one time during the launch phase. The RSO at BDA can also uplink range safety CMDs on UHF.

56.3 CMD CARRIER RADIATION CONTROL

Refer to paragraph 3.4.5 of the NOD for control procedures.

56.4 EQUIPMENT CONFIGURATION

56.4.1 TRANSMISSION EQUIPMENT

BDA UHF CMD transmission equipment will be configured as directed in the NOD.

56.4.2 MSFN ANTENNA CONFIGURATION

Prime and backup designations for quadhelix 1 and 2 antennas will be a station option. Antenna configuration will be as noted in table 56-1

Table 56-1. ETR/BDA Launch Support

Station	Carrier On Carrier Off	Power	Antenna	
			Prime	Backup
ANT	Carrier on/off times are variable depending upon the launch azimuth.	High	TEMEC	ESCO
CNV**		High	Omni	H. P. Helix
GBI		High	ESCO 1	ESCO 2
BDA		High	Quadhelix (1 or 2)	Quadhelix (1 or 2)
GTK*		High	AGA	ESCO

*Backup to BDA

**Omnidirectional antenna may be switched to steerable quadhelix antenna in plus time to provide coverage until BDA AOS.

1. The first part of the report is a general introduction to the subject of the study. It discusses the importance of the study and the objectives of the research.

2. The second part of the report is a detailed description of the methodology used in the study. It includes information about the sample size, the data collection methods, and the statistical analysis techniques.

3. The third part of the report is a presentation of the results of the study. It includes tables, figures, and text describing the findings of the research.

4. The fourth part of the report is a discussion of the results and their implications. It includes a comparison of the findings with previous research and a discussion of the limitations of the study.

5. The fifth part of the report is a conclusion and a summary of the findings. It includes a final statement about the importance of the study and the recommendations for future research.

6. The sixth part of the report is a list of references. It includes a list of all the sources used in the study, including books, articles, and other documents.

7. The seventh part of the report is an appendix. It includes any additional information that is relevant to the study, such as raw data, additional tables, or figures.

8. The eighth part of the report is a glossary. It includes definitions of all the key terms used in the study, ensuring that the reader can understand the terminology.

9. The ninth part of the report is a list of abbreviations. It includes a list of all the abbreviations used in the study, ensuring that the reader can understand the shorthand used.

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14. The fourteenth part of the report is a list of abbreviations. It includes a list of all the abbreviations used in the study, ensuring that the reader can understand the shorthand used.

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Supplement to Section 57

Telemetry

SUPPLEMENT TO SECTION 57. TELEMETRY

57.1 TELEMETRY (TLM) SUPPORT

57.1.1 GENERAL

TLM support from MSFN stations for this mission will include but not be limited to:

- a. Receiving, recording, and decommutating selected S-II, S-IVB, and IU VHF links
- b. Recording and decommutating CSM, LM, and IU USB links
- c. Remoting selected parameters and biomed data to MCC via GSFC
- d. Receiving and recording ARIA data transfer at selected ground stations
- e. Receiving, recording, and remoting TLM dump-transmission data, including CSM-H, CSM-L, and LM-L links
- f. Receiving and remoting selected USB links from MIL to CIF
- g. Receiving, recording, and remoting the S-IC VHF links from MIL to CIF
- h. Receiving, recording, decommutating, and remoting the ALSEP-2 USB link to MCC. (Refer to Annex C of the NOD for ALSEP support procedures.)

57.1.2 DATA TRANSMISSION

Data transmission requirements to MCC through GSFC include:

- a. Selected parameters from CP-1, and DP-1 links from ACN, ANG, BDA, CRO, CYI, GBM, GWM, GYM, HAW, MIL, TEX, VAN, RED, and MER via 2.4-kbps HSD lines.
- b. Selected CSM parameters from the 2287.5- and/or 2272.5-MHz links (MCC real-time request); LM parameters from the 2282.5- and/or 2272.5-MHz links; IU parameters from the 2282.5-MHz links from ACN, ANG, BDA, CRO, CYI, GBM, GDS, GDSX, GWM, GYM, HAW, HSK, HSKX, MAD, MADX, MIL, TEX, VAN, RED, MER, MARS, and Parkes via 2.4-kbps HSD lines (GDSX, MADX, HSKX, MARS, and Parkes will remote data via the corresponding 85-foot MSFN station.)

Note

LM and IU data will not be downlinked simultaneously on the 2282.5-MHz data link.

- c. FM remoting of biomed and contingency parameters from ACN, ANG, BDA, CYI, CRO, GBM, GDS, GWM, GYM, HAW, HSK, MAD, MIL, RED, TEX, VAN, and MER.
- d. Selected S-II parameters from the BF-1, and BF-2, links from ANG, BDA, and MIL through the discriminators and the Analog Multiplexer Quantizer (AMQ) via 2.4-kbps HSD lines

- e. Selected S-II parameters from the BP-1 link from ANG, BDA, and MIL via the 2.4-kbps HSD lines
- f. Commerical TV from GDS, MAD, HSK, and Parkes
- g. Selected EMU (EVCS PAM) parameters from HSK, GDS, MAD, MIL, through DDF-13 via the 2.4-HSD lines.

57.1.3 SPECIAL TLM SUPPORT

57.1.3.1 DSS-71 Support. The DSS-71 (JPL station, Merritt Island) USB antenna will support the Countdown Demonstration Test (CDDT), launch countdown, and launch phase through LOS on a non-interference basis. PM video will be transmitted to MIL via the A2A circuit. A voice coordination loop will be established between the DSS-71 stations and MIL USB. DSS-71 will also provide signal strength recordings and polaroid photographs of the spectrum display showing sideband relationships. Video from DSS-71 will be used if the MIL USB antenna fails.

57.1.3.2 MIL Launch Phase Remoting. During the terminal count and through MIL LOS during launch, MIL will remote to CIF on the A2A line the following links:

- a. AF-1 - 256.2 (S-IC)
- b. AP-1 - 244.3 (S-IC)
- c. BF-1 - 241.5 (S-II)
- d. BF-2 - 234.0 (S-II)
- e. BP-1 - 248.6 (S-II)
- f. CP-1 - 258.5 (S-IVB)
- g. DP-1 - 245.3 (IU)
- h. DP-1B - 2282.5 MHz (IU)
- i. CSM (2287.5 MHz or 2272.5 MHz)

57.1.3.3 MIL Launch Phase Backup Links. MIL USB will receive the following links from CIF via multiplex on an A2A line:

- a. 2287.5 MHz (CSM)
- b. DP-1 - 245.3 MHz (IU)
- c. CP-1 - 258.5 MHz (S-IVB)
- d. BP-1 - 248.6 MHz (S-II)

57.1.3.4 MIL, BDA, and ANG S-II Parameters. The S-II parameters listed in table 57-1 will be processed by FM discriminators, multiplexed and quantized by the AMQ, and included in the HSD format.

57.1.3.5 Onboard Television. GDS, MAD, and HSK will receive and remote real-time scan-converted TV to MCC. ~~The CSM will downlink TV in TV modes II or III.~~ ^{& PARKES} PDC #2

THE CSM WILL DOWNLINK COLOR TV ONLY. THE LM WILL DOWNLINK SLOWSCAN BLACK AND WHITE TV IN MODES II OR III. REFER TO SECTION 57 OF THE NOD FOR TV MODE DESCRIPTIONS. 151# 19

Table 57-1. AMQ Parameter Assignments

AMQ Channel	Meas No.	FM Link	Meas Name
0	N/A	N/A	Ground input (zero volt reference)
1	D13-201	BF2-12	E1 Thrust Chamber Press
2	D13-202	BF2-13	E2 Thrust Chamber Press
3	D13-203	BF2-11	E3 Thrust Chamber Press
4	D13-204	BF1-13	E4 Thrust Chamber Press
5	D13-205	BF1-12	E5 Thrust Chamber Press
6	Blank		
through			
11			
12*	Prime Station Rcvr CSM/Rcvr No. 1 AGC	PDC # 24	
13*	Wing Station Rcvr LM/Rcvr No. 5 AGC		

*For GDS, HSK, and MAD only.

Note

Use standard IRIG output filters in the S-II discriminators.

57.1.3.6 AMQ Assignments and Setup.

a. Refer to table 57-1 for the AMQ channel assignments. Refer to Section 57 of NOD for the AMQ switch settings.

b. At the 85-foot stations and their wings, the CSM and LM receiver AGCs will be routed into a matrix and, dependent on the system/vehicle combination, the proper receiver AGC patched into the AMQ. The calibration of the receiver output vs AMQ output (001-376 octal) will be found in paragraph 57.6.1.6d.

c. **ANYTIME THE AMQ IS POWERED DOWN TELEMETRY WILL NOTIFY THE COMPUTER SECTION TO SET THE AMQ 1299 SWITCH TO THE NEUTRAL POSITION.** 15179

Name	Age	Sex	Occupation
John Doe	25	Male	Teacher
Jane Smith	30	Female	Nurse
Robert Johnson	45	Male	Engineer
Mary White	28	Female	Writer
David Brown	35	Male	Doctor
Susan Green	22	Female	Student
Michael Black	40	Male	Lawyer
Emily Davis	32	Female	Artist

Location (°N)	Time (h)	Wind (m/s)	Temp (°C)	Humidity (%)	Pressure (hPa)
10.5	10.0	1.5	28.0	85	1013.0
10.5	11.0	2.0	28.5	86	1013.0
10.5	12.0	2.5	29.0	87	1013.0
10.5	13.0	3.0	29.5	88	1013.0
10.5	14.0	3.5	30.0	89	1013.0
10.5	15.0	4.0	30.5	90	1013.0
10.5	16.0	4.5	31.0	91	1013.0
10.5	17.0	5.0	31.5	92	1013.0
10.5	18.0	5.5	32.0	93	1013.0
10.5	19.0	6.0	32.5	94	1013.0
10.5	20.0	6.5	33.0	95	1013.0
10.5	21.0	7.0	33.5	96	1013.0
10.5	22.0	7.5	34.0	97	1013.0
10.5	23.0	8.0	34.5	98	1013.0
10.5	24.0	8.5	35.0	99	1013.0
10.5	25.0	9.0	35.5	100	1013.0

57.1.3.7 FM Discriminators. The FM discriminators will discriminate the S-II parameters and input to the AMQ. They will also discriminate the LM EKG, EMU EKGs, and EVCS (PAM) data. In addition, the following will apply:

a. The S-II parameters are required from MIL, BDA, and ANG only.

PDC # 24 | b. The ¹¹⁰~~200~~-Hz filters will be used for the EMU EVCS discriminators. The DELAY/AMPLITUDE switch should be set to the AMPLITUDE position. THESE DISCRIMINATORS WILL BE USED FOR THE PAM CHANNELS. PDC # 2

ISI # 10 | c. For the EKGs from LM and EMU, the wideband output of the LM voice sub-carrier demod will be used as the primary input to the EMR-210 discriminators. THE DELAY/AMPLITUDE SWITCH SHOULD BE SET TO THE DELAY POSITION AND THE OUTPUT FILTER WILL BE 35 HZ.

d. The Vidar calibrator will be used to calibrate the discriminator AMQ setup. The lower band-edge output of the calibrator will result in an AMQ output of 001_g. The upper band-edge output of the calibrator will result in a 376_g output. Care must be exercised at upper bands so that the AMQ output is adjusted at the point where the transition to 376_g takes place.

57.1.3.8 LM FM Subcarriers. The 1.25 MHz-composite is a subcarrier down-linked in LM USB modes 1, 2, 9, and 10. When the LM is in mode 8, the LM voice and additional subcarriers (IRIG 9 through 13) are modulated directly on the PM base band. The 1.25-MHz composite subcarrier will contain LM voice and additional subcarriers at frequencies of IRIG channels 9 through 13. IRIGs 9 through 12, present only during dual EVA (LM USB modes 9 and 10) will contain Portable Life Support System (PLSS) data from the Extra Vehicular Communicator (EVC) one and two. IRIG 13, present at all times, will contain EKG from the LM only when LM is manned. Refer to table 57-2 for data assigned to these IRIG channels.

Table 57-2. LM FM IRIG Allocations

EVC No. 1			
	IRIG	Freq (kHz)	Deviation (%)
EKG	10	5.4	±7.5
PAM	12	10.5	±7.5
EVC No. 2			
	IRIG	Freq	Deviation
EKG	9	3.9	±7.5
PAM	11	7.35	±7.5
LM			
	IRIG	Freq	Deviation
EKG	13	14.5	±7.5

1. The first part of the report is a summary of the work done during the last year. It is a very brief summary, but it gives a good idea of the work done. It is written in a very simple and straightforward manner, and it is easy to read. It is a very good example of a summary of work done.

2. The second part of the report is a description of the work done during the last year. It is a very detailed description, and it gives a good idea of the work done. It is written in a very simple and straightforward manner, and it is easy to read. It is a very good example of a description of work done.

3. The third part of the report is a conclusion. It is a very brief conclusion, but it gives a good idea of the work done. It is written in a very simple and straightforward manner, and it is easy to read. It is a very good example of a conclusion of work done.

C. SIMULTANEOUS APOLLO ALSEP SUPPORT.

STATIONS WITH THREE WIDE BAND RECORDERS WILL SET UP PER PARAGRAPH 57.1.3.9B2 ABOVE. DATA LOSSES WHILE CHANGING TAPES ARE EXPECTED. AT STATIONS WITH ONLY TWO WIDE BAND RECORDERS TRACK 9 (LM EKG) WILL BE DELETED AND 2276.5 MHZ ALSEP VIDEO WILL BE RECORDED IN THE FM MODE. AT 85 FOOT SITES WHEN THE LM IS POWERED UP, TRACK 13 OF RECORDERS 1 AND 2 WILL BE RE-ASSIGNED TO 2276.5 MHZ ALSEP VIDEO RECORDED IN THE FM MODE. WHEN THE LM IS NOT POWERED UP 2276.5 MHZ ALSEP VIDEO WILL BE RECORDED ON TRACK 7 IN THE FM MODE ON RECORDERS 1, 2, 3 AND 4, AT 85 FOOT SITES.

57.1.3.11 TIME CODE TRANSLATOR AND DATA PLAYBACK. - FOR THE DURATION OF THE MISSION, THE OUTPUT OF TRACK 14 OF THE ACTIVE WIDEBAND MAGNETIC TAPE RECORDER WILL BE PATCHED TO AN IRIG DISCRIMINATOR, AND THE OUTPUT OF THE DISCRIMINATOR WILL BE PATCHED TO THE DATATRON TIME CODE TRANSLATOR INPUT. THE OUTPUT OF THE DISCRIMINATOR WILL BE SET TO 3 VPP. WHEN MCC REQUESTS DATA PLAYBACK, THE APPROPRIATE WIDEBAND RECORDER MUST BE PATCHED TO THE IRIG 18 DISCRIMINATOR. DURING PASSES, THE FRONT PANEL INDICATOR ON THE TRANSLATOR SHOULD BE CHECKED TO ENSURE THAT IT IS UPDATED EVERY SECOND AND THAT THE TIME INDICATED IS THE ACTUAL GMT (MINUS RECORD/REPRODUCE TIME). BEFORE THE TRANSLATOR OUTPUT WILL APPEAR IN THE 2.4 KBPS OUTPUT DATA, THE FOLLOWING CONDITIONS MUST BE SATISFIED:

- A. A PLAYBACK FORMAT (FMT) MUST BE SELECTED ON THE COMPUTER (100, 200, OR 300 SERIES FMT)
- B. THE PLAYBACK BIT MUST BE SET
- C. THE CSM, LM, OR IU DECOM MUST BE IN LOCK; TRACK 5 MAY BE PATCHED DIRECTLY INTO THE TIME CODE TRANSLATOR.

ANYTIME THE TIME CODE TRANSLATOR IS POWERED DOWN, TELEMETRY WILL NOTIFY THE COMPUTER SECTION TO SET THE GMT TAPE PLAYBACK 1299 SWITCH TO THE NEUTRAL POSITION.

57.1.3.9 ALSEP-2 Support

a. General. After lunar landing the ALSEP-2 package, designated EASEP, will be deployed by the astronauts. Once this package is activated, it will become necessary for MSFN stations to support the data from the ALSEP and remote it to MCC. This will require a reconfiguration of the station from an Apollo configuration to an ALSEP configuration. The station may be required to revert back to Apollo support after a specified amount of time.

b. Configuration Changes. When reconfiguring to ALSEP, certain telemetry configurations for Apollo support will be maintained. These configurations are as follows:

(1) The No. 1 wideband magnetic tape recorder should be maintained in an Apollo configuration. This will apply to all stations that have at least three wideband tape recorders. Stations having only two wideband recorders will have to reconfigure both recorders.

(2) Recorder No. 3, at stations with three wideband recorders, can be set up as prime ALSEP recorder and not changed during Apollo support. This allows recorder No. 2 to be the only recorder needed to be reconfigured when changing from ALSEP support to Apollo support or vice versa.

SEE BELOW
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(3) Biomed patching and AGC and SPE patching on the DSDU.

(4) All AMQ and PAM setups.

57.1.3.10 Data Transfer To ARIA (RED and MER). The TLI data from RED and MER will be transferred to an ARIA. The links to be transferred and modes of transfer are as follows:

	<u>Data</u>	<u>Track</u>	<u>Subcarrier</u>	<u>S-band Link (MHz)</u>
Pass 1	DP-1	11	1.024 MHz	2282.5
	DF-1	8	450 kHz	2282.5
	Timing	5	1.25 MHz	2282.5
Pass 2	CP-1	6	1.024 MHz	2282.5
	DF-1	12	450 kHz	2282.5
	Timing	5	1.25 MHz	2282.5
Pass 3	CSM TLM Video	13	1.024 MHz	2282.5
	Timing	5	1.25 MHz	2282.5

For detail transfer procedures, refer to Section 62 of these supplements.

57.1.3.9.6 (2). AFTER TLI, RECORDER NO. 3, AT STATIONS WITH THREE WIDEBAND RECORDERS CAN BE SET UP AS A PRIME ALSEP RECORDER AND NOT CHANGED DURING APOLLO SUPPORT. ~~ADD NEW SENTENCE TO END OF PAR. 505, MAD, AND RSK WILL MAKE NO RECORDER RECONFIGURATION FOR RESET UNTIL APOLLO MISSION TERMINATION.~~

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151 #19

SEP
NEW
PAGE57.1.3.9 ALSEP-2 Support

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b. Configuration Changes. When reconfiguring to ALSEP, certain telemetry configurations for Apollo support will be maintained. These configurations are as follows:

- (1) The No. 1 wideband magnetic tape recorder should be maintained in an Apollo configuration. This will apply to all stations that have at least three wideband tape recorders. Stations having only two wideband recorders will have to reconfigure both recorders.
- (2) Recorder No. 3, at stations with three wideband recorders, can be set up as prime ALSEP recorder and not changed during Apollo support. This allows recorder No. 2 to be the only recorder needed to be reconfigured when changing from ALSEP support to Apollo support or vice versa.
- (3) Biomed patching and AGC and SPE patching on the DSDU.
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	<u>Data</u>	<u>Track</u>	<u>Subcarrier</u>	<u>S-band Link (MHz)</u>
Pass 1	DP-1	11	1.024 MHz	2282.5
	DF-1	8	450 kHz	2282.5
	Timing	5	1.25 MHz	2282.5
Pass 2	CP-1	6	1.024 MHz	2282.5
	DF-1	12	450 kHz	2282.5
	Timing	5	1.25 MHz	2282.5
Pass 3	CSM TLM Video	13	1.024 MHz	2282.5
	Timing	5	1.25 MHz	2282.5

For detail transfer procedures, refer to Section 62 of these supplements.

57.1.4 TELEMETRY LINKS

57.1.4.1 VHF Telemetry Links. The VHF telemetry links are as follows:

<u>Link</u>	<u>Veh</u>	<u>Nominal Freq (MHz)</u>	<u>Terminal Count CRF Freq</u>	<u>Nominal Maximum Deviation (kHz)</u>	<u>Terminal Count CRF</u>	<u>Terminal Count CRF Change/ No Change</u>
AF-1*	SIC	256.2		±137.5		
AP-1*	SIC	244.3		±39		
BF-1*	S-II	241.5		±137		
BF-2*	S-II	234.0		±137		
BP-1*	S-II	248.6		±39		
CP-1	S-IVB	258.5		±39		
DF-1	IU	250.7		±137		
DP-1**	IU	245.3		±39		

*Active only on launch

**Identical telemetry data to 2282.5 MHz link (DP-1B)

Note

The blanks under the terminal count CRF columns are provided as an aid to the VHF receiver technician.

57.1.4.2 EVCS Data. The Extra-Vehicular Communications System (EVCS) consists of VHF communications, EKGs, and PAM data. The EKGs and PAM are on IRIGs 9 through 12 (see paragraph 57.1.3.8 and table 57-2). The PAM data is commutated at a 30-by 1 1/2-(45 pps) rate. The PAM decommutator switch settings and general program description are found in paragraph 57.6.3. Refer to the alpha-numeral listings for PAM contents.

57.1.4.3 USB Telemetry Links. USB telemetry link assignments are given in Section 54 of the NOD.

57.2 VHF TELEMETRY RECEIVER COVERAGE

The following stations will receive VHF TLM data: ACN, ANG, BDA, CRO, CYI, GBM, GWM, GYM, HAW, HTV, MER, MIL, RED, TAN, TEX, and VAN. Individual stations will configure their systems to receive VHF TLM data in accordance with the telemetry receiver setup tables at the end of this section.

57.3 RECORDER CONFIGURATION INSTRUCTIONS57.3.1 MAGNETIC TAPE RECORDERS

57.3.1.1 General. Tape recorder assignments for supporting stations are contained in the telemetry recorder setup tables at the end of this section. The MCC wideband recorders will be run at 30 ips except where noted in paragraphs 57.3.1.2b and 57.3.1.4. The MSFC wideband recorders will be run at 60 ips. After S-IVB/IU battery depletion, recorder No. 2 or 3 will be configured and operated the same as recorder No. 1 at ACN, CRO, GWM, GBM, MER, VAN, RED, and HTV. After

TLI + 3 hours, 30-foot antenna USB stations will record only during the following conditions:

- a. When scheduled to go two-way on any link
- b. During DSE dumps scheduled by SCM
- c. When scheduled by the SCM as a backup to a two-way station
- d. On request from TIC.

Eighty-five-foot antenna USB stations will record during all periods of acquisition. At all stations, recorders will be operated in series, starting the next recorder 1 minute prior to the first recorder running out of tape.

Note

1. The contents of the USB mixer are found in Section 54 of these supplements.
2. All stations may, at their discretion, record extraneous data on open tracks. This will not interfere with the required data. Tape labels will be annotated to show the type of data recorded, and that the data recorded was at the station's option. Should a requirement for the open track occur, it will have precedence over the station's optional recorded data.

← 3. PDC # 10
57.3.1.2 Tape Recorder Data Description. The following are descriptions of recorder links and data on those links:

- a. 2287.5-MHz TLM Video. This is the PCM 51.2/1.6-kbps data output of the 1.024 SDDS demod.
- b. 2272.5-MHz TV or Voice. The TV will be from the USB TV output and recorded in the FM mode. The voice will be dump voice patched from the output of the 64-kHz voice filter via the C-COR or HP-467 video amplifier and will be recorded direct.
- c. 2272.5-MHz TLM Demod. This is the CSM dump or real-time PCM 51.2/1.6-kbps data output of the 1.024 SDDS demod.
- d. 2282.5-MHz LM TLM Demod. LM real-time PCM data from the 1.024 SDDS demod.
- e. LM EKG. This will also contain the LM voice and will be patched from the output of the 1.25-MHz SDDS demod for modes 1, 2, 7, 9, and 10. For mode 8 the data is on baseband and will be output of the PM buffer. | 151#19
- f. 2272.5-MHz LM S~~o~~ Dump. This is the dump data for LM and will be the output of the FM carrier demod.
- g. 1.25-MHz EVC Composite. Required only at 85-foot stations and MIL this is LM EKG and the EVC data from the LM and will be the output of the 1.25-MHz SDDS demod (2282.5) for modes 1, 2, 7, 9 & 10. For mode 8 the data is baseband and under this condition will be from the output of the PM buffer (ref. 57.1.3.8 for EVC description). | 151#19

TLI + 3 hours, 30-foot antenna USB stations will record only during the following conditions:

- a. When scheduled to go two-way on any link
- b. During DSE dumps scheduled by SCM
- c. When scheduled by the SCM as a backup to a two-way station
- d. On request from TIC.

Eighty-five-foot antenna USB stations will record during all periods of acquisition. At all stations, recorders will be operated in series, starting the next recorder 1 minute prior to the first recorder running out of tape.

Note

1. The contents of the USB mixer are found in Section 54 of these supplements.
2. All stations may, at their discretion, record extraneous data on open tracks. This will not interfere with the required data. Tape labels will be annotated to show the type of data recorded, and that the data recorded was at the station's option. Should a requirement for the open track occur, it will have precedence over the station's optional recorded data.

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- c. 2272.5-MHz TLM Demod. This is the CSM dump or real-time PCM 51.2/1.6-kbps data output of the 1.024 SDDS demod.
- d. 2282.5-MHz LM/TLM Demod. LM real-time PCM data from the 1.024 SDDS demod.
- e. LM EKG. This will also contain the LM voice and will be patched from the output of the 1.25-MHz SDDS demod for modes 1, 2, 9, and 10. For mode 8 the data is on baseband and will be output of the PM buffer.
- f. 2272.5-MHz LM S/D Dump. This is the dump data for LM and will be the output of the FM carrier demod.
- g. 1.25-MHz EVC Composite. Required only at 85-foot stations and MIL this is LM EKG and the EVC data from the LM and will be the output of the 1.25-MHz SDDS demod (2282.5) for modes 9 and 10. For mode 8 the data is baseband and under this condition will be from the output of the PM buffer (ref. 57.1.3.8 for EVC description).

57.3.1.3 Annotations and Calibrations

- a. When required data is not being recorded on its assigned track, voice annotation will be made giving the reason for the data absence; for example, data not being downlinked or recorder track failure. The data label should also be annotated to indicate a blank track.
- b. All prepass and postpass calibrations will be made at 15 ips and annotated per Section 35 of the NOD.

57.3.1.4 Additional Instructions

- a. All predetection recordings of Saturn Launch Vehicle (SLV) VHF TLM links will be centered at 450 kHz.
- b. VHF receiver signal strength will be recorded on magnetic tape as directed by the station's receiver setup tables at the end of this section.
- c. The biomed mixer output will be patched to the external (direct) input of mixer No. 1 (reference EI-3779).

57.3.1.5 2272.5-MHz Link. The 2272.5-MHz link can be downlinked in one of twelve modes. Refer to USB, Section 54 of the NOD, for detailed mode descriptions. The particular mode for each station will be indicated in the SCM and/or by voice direction. During all dumps, run the wideband recorder at 120 ips. This will eliminate problems experienced on prior missions. The TIC will inform the station whenever a dump is scheduled. Upon cue by the TIC, set speed at 120 ips and start the recorder to be used for dump recording. Stations should bear in mind that the SCM can schedule a station for CSM HBR dump and in actuality the dump received will contain both CSM HBR and CSM HLBR.

57.3.1.6 Telemetry Dump Recording and Playback Procedures

- a. General. Thirty seconds prior to the actual dump the TIC will notify the station(s) to standby for a dump. Stations will start their dump recorders at 120 ips. The dump will be in two transmissions, LM and CSM, with approximately 5 minutes between segments for rewinding the tape aboard the CSM. As soon as the dump has been completed, the station(s) will switch to the real-time recorder (started 1 minute prior to turning off the dump recorder) and operate it at 30 ips.
- b. Sequence of Events for Recording Dumps
 - (1) The TIC will verbally notify stations of dump modulation at -30 seconds. At this time stations scheduled for the dump will start the fully loaded recorder at 120 ips. Stations will reload the recorder not recording dump data and standby for the end of the dump (LOS of dump modulation).

57.3.1.3 Annotations and Calibrations

- a. When required data is not being recorded on its assigned track, voice annotation will be made giving the reason for the data absence; for example, data not being downlinked or recorder track failure. The data label should also be annotated to indicate a blank track.
- b. All prepass and postpass calibrations will be made at 15 ips and annotated per Section 35 of the NOD.

57.3.1.4 Additional Instructions

- a. All predetection recordings of Saturn Launch Vehicle (SLV) VHF TLM links will be centered at 450 kHz.
- b. VHF receiver signal strength will be recorded on magnetic tape as directed by the station's receiver setup tables at the end of this section.

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~~c. The biomed mixer output will be patched to the external (direct) input of mixer No. 1 (reference EI-3779).~~

57.3.1.5 2272.5-MHz Link. The 2272.5-MHz link can be downlinked in one of twelve modes. Refer to USB, Section 54 of the NOD, for detailed mode descriptions. The particular mode for each station will be indicated in the SCM and/or by voice direction. During all dumps, run the wideband recorder at 120 ips. This will eliminate problems experienced on prior missions. The TIC will inform the station whenever a dump is scheduled. Upon cue by the TIC, set speed at 120 ips and start the recorder to be used for dump recording. Stations should bear in mind that the SCM can schedule a station for CSM HBR dump and in actuality the dump received will contain both CSM HBR and CSM HLBR.

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- b. Sequence of Events for Recording Dumps
 - (1) The TIC will verbally notify stations of dump modulation at -30 seconds. At this time stations scheduled for the dump will start the fully loaded recorder at 120 ips. Stations will reload the recorder not recording dump data and standby for the end of the dump (LOS of dump modulation).

(2) At end of dump modulation, stations will start the recorder that was re-loaded during the dump. This recorder will operate at 30 ips. This will ~~allow~~ PDC #2. allow 60 minutes of continuous recording during which time the TIC may request playback of any dump data requested.

c. Typical Example of Dump Sequence of Events

(1) MAD is standing by to acquire the spacecraft after lunar occultation. At emergence-2 minutes recorders No. 1 and 3 are started at 30 ips.

(2) At spacecraft emergency + 10 minutes the TIC will inform the MAD M&O that a dump is being scheduled at emergence + 15 minutes and the data to be dumped will be CSM and LM data.

(3) After turning on the FM transmitter and confirming sufficient FM signal strength to receive good quality dump data, the TIC will inform the MAD M&O that the dump will start in 30 seconds.

(4) The recorder tech at MAD will start recorders No. 2 and 4 at 120 ips, and reload recorders No. 1 and 3. If the dump should last longer than 15 minutes, recorders No. 1 and 3 will be started at 120 ips 1 minute prior to end of tape on recorders No. 2 and 4 and continue recording until the dump has ended.

(5) As soon as dump modulation ends, recorders No. 1 and 3 are started (or 2 and 4 if dump exceeded 15 minutes) at 30 ips. This will allow the TIC 60 minutes to playback dump data without interrupting the requirement to record real-time data. If the playback should require more than 60 minutes, the TIC will allow the station time to reload the necessary recorders so that the station will not lose any real-time data.

(6) Stations will ensure that there are no speed changes on data tapes. The tape used for dump recording can contain more than one dump; however, they will not contain any real-time data recorded at 30 ips. Ensure that clear annotation, including the word "dump", is made on the tape label so that no possible confusion could exist during postmission analysis by the final data users.

57.3.1.7 Special Telemetry Procedures. The following combinations will be given to the station by the TIC either prepass or during the pass if special processing is required. The four combinations should cover all possible requirements; however, in a contingency any part of any combination may be modified. Stations will follow bit-rate changes using specified decom formats and ensure that particular attention is given to the setting of playback bits when called for. The four combinations are as follows:

Combination 1

a. CSM PM TLM HBR or LBR

Decom Format

Playback Bit Set

Input to Computer

CSM HBR or CSM LBR

No

Yes

b. LM PM Telemetry HBR or LBR

<u>Decom Format</u>	<u>Playback Bit Set</u>	<u>Input to Computer</u>
LM HBR or LM LBR	No	Yes

c. CSM FM

(1) CSM dump TLM

<u>Decom Format</u>	<u>Playback Bit Set</u>	<u>Input to Computer</u>
CSM HBR	Yes	Yes
CSM HLBRD	Yes	Yes

(2) LM dump TLM

<u>Decom Format</u>	<u>Playback Bit Set</u>	<u>Input to Computer</u>
LM HLBRD	Yes	Yes
LM MLBRD	Yes	Yes

d. Biomed from CSM PM and LM PM downlinks

e. CSM FM downlink voice may be requested to be remoted to MCC while CSM HBR dump is in process.

Note

Dump TLM is remoted to MCC in real time as it is being received in this combination.

Combination 2

a. CSM PM TLM HBR or LBR

<u>Decom Formats</u>	<u>Playback Bit Set</u>	<u>Input to Computer</u>
CSM HBR or CSM LBR	Yes	Yes

b. LM PM TLM HBR or LBR

<u>Decom Formats</u>	<u>Playback Bit Set</u>	<u>Input to Computer</u>
LM HBR or LM LBR	No	Yes

c. CSM FM

<u>Decom Formats</u>	<u>Playback Bit Set</u>	<u>Input to Computer</u>
CSM HBR	No	Yes
CSM HLBRD	No	No
Note		

Only the CSM HBR dump TLM will be remoted to MCC.

d. Biomed from CSM FM and LM PM downlinks

e. CSM FM downlink voice may be requested to be remoted to MCC when CSM HBR dump is in process.

Note

Dump TLM is remoted to MCC in real time as it is being received in this combination.

Combination 3

a. CSM PM TLM HBR or LBR

<u>Decom Formats</u>	<u>Playback Bit Set</u>	<u>Input to Computer</u>
CSM HBR or CSM LBR	No	Yes

b. LM PM TLM HBR or LBR

<u>Decom Formats</u>	<u>Playback Bit Set</u>	<u>Input to Computer</u>
LM HBR or LM LBR	No	Yes

c. Tape playbacks during active station support of real-time links are as follows:

<u>Data</u>	<u>Playback Bit Rate (kbps)</u>	<u>Decom Format</u>	<u>Playback Bit Set</u>	<u>Input to Computer</u>
(1) CSM dump TLM HBR	51.2	CSM HBR	Yes	Yes
(2) CSM dump TLM HLBR	51.2	CSM HLBRD	Yes	Yes
(3) CSM dump TLM HLBR	12.8 (note)	CSM LBRD	Yes	Yes
(4) CSM dump TLM LBR	1.6	CSM LBRD	Yes	Yes
(5) CSM PM TLM HBR	51.2	CSM HBR	Yes	Yes
(6) CSM PM TLM LBR	1.6	CSM LBRD	Yes	Yes

<u>Data</u>	<u>Playback Bit Rate (kbps)</u>	<u>Decom Format</u>	<u>Playback Bit Set</u>	<u>Input to Computer</u>
(7) LM dump TLM HLBR	1.6 at 51.2	LM HLBRD	Yes	Yes
(8) LM dump TLM HLBR	1.6 at 12.8	LM MLBRD	Yes	Yes
(9) LM dump TLM MLBR	12.8	LM MLBRD	Yes	Yes
(10) LM dump TLM HLBR or MLBR	1.6	LM LBRD	Yes	Yes
(11) LM PM TLM HBR	51.2	LM HBR	Yes	Yes
(12) LM PM TLM LBR	1.6	LM LBRD	Yes	Yes

Note

Use the wide band signal conditioner and manually set up 12.8 kb for bit rate. P/B recorder speed will be 30 ips.

d. Biomed from CSM PM and LM PM (from RT source not tape P/B)

e. Playback voice may be requested from recorded data that is being remoted per items C (1) or (4).

Combination 4

a. CSM PM TLM HBR or LBR

<u>Decom Formats</u>	<u>Playback Bit Set</u>	<u>Inputs to Computer</u>
CSM HBR or CSM LBR	Yes	Yes

b. LM PM TLM HBR or LBR

<u>Decom Formats</u>	<u>Playback Bit Set</u>	<u>Inputs to Computer</u>
LM HBR or LM LBR	No	Yes

c. Tape playbacks during active station support of active real-time links are as follows:

<u>Data</u>	<u>Playback Bit Rate</u>	<u>Decom Format</u>	<u>Playback Bit Set</u>	<u>Input to Computer</u>
(1) CSM Dump TLM HBR	51.2	CSM HBR	No	Yes
(2) CSM dump TLM HLBR	51.2 (note 1)	CSM LBR	No	Yes
(3) CSM dump TLM HLBR	12.8 (note 2)	CSM LBR	No	Yes

<u>Data</u>	<u>Playback Bit Rate</u>	<u>Decom Format</u>	<u>Playback Bit Set</u>	<u>Input to Computer</u>
(4) CSM dump TLM HLBR	1.6	CSM LBR	No	Yes
(5) CSM PM TLM HBR	51.2	CSM HBR	No	Yes
(6) CSM PM TLM LBR	1.6	CSM LBR	No	Yes

Notes

1. Use the wideband signal conditioner and manually select 51.2 kbps. Recorder speed will be 120 ips.
2. Use the wideband signal conditioner and manually select 12.8 kbps. Recorder speed will be 30 ips.

d. Biomed from LM PM and CSM HBR playback

e. Playback voice may be requested from playback source for remoting to MCC.

57.3.1.8 Combination Explanations

a. Combinations 1 and 2 are typical data requirements during TEI, TLI, etc. and also allow simultaneous reception of LM and two CSM sources, FM-CSM and PM-CSM, at MCC.

b. Combination 3 is typical data requirement when a station is in active pass support and a tape playback is required with the playback bit set. Should a station be called upon for tape playback when not in pass activity, most likely only paragraphs c, d, and e, in their entirety or in part, may be required.

c. Combination 4 is a typical data requirement when a station is in active pass support and previously recorded data would be required in MCC as real-time data with no playback bit set. The data received in real time would be remoted to MCC with the playback bit set to allow simultaneous reception of two CSM sources.

57.3.1.9 Example of Typical Combinations During TEI (Combination 1)

<u>ACN</u>	<u>GDS</u>	<u>MAD</u>
Normal data processing	A. CSM PM real time	A. CSM PM real time
No combination would be voiced to station. MSFN formats 7 and 9. CSM PM downlink and biomed would be remoted to MCC.	B. LM- N/A	B. LM TLM - N/A
	C. CSM FM playback bit set (CSM dump)	C. CSM FM playback bit set (CSM dump)
	D. Biomed from the CSM PM downlink	D. FM remoting FMT 9 from CSM dump
	E. N/A	E. CSM FM downlink voice to MCC

The combinations previously listed will be voiced to stations in the following manner:

GDS: Combination 1: No LM required; paragraph e not required.

MAD: Combination 1: No LM required; change paragraph d to FM remoting;
FMT 9, CSM dump is data source.

MSFN Formats

MAD - 107 and 109

GDS - 008 and 110

ACN - 007 and 009

The redundancy of data availability in MCC is clearly shown in the above examples should line failures occur or station problems develop.

The reasons for setting playback bits on decoms result from the flight controller requirement for routing certain data at MCC to real-time displays and others to playback displays.

Note

The configuration in the example could be from any three stations in the network.

57.3.2 COMMUNICATIONS RECORDERS

57.3.2.1 Recorder Assignments. Voice communications will be recorded on the following recorders:

- a. FR-1100/GS-80: ACN, ANG, BDA, CYI, CRO, GBM, GDS, GWM, GYM, HAW, HSK, MAD, MIL, and TEX
- b. AMP-300: MER, RED, and VAN
- c. GR-2500: HTV
- d. C-100: CAL
- e. FR-607: TAN

57.3.2.2 Recorder Track Assignments and Speeds. Communications recorder track assignments are contained in the recorder configuration tables at the end of this section. Recording speeds are as follows:

- a. FR-1100/GS-80, GR-2500, and AMP-300: 1-7/8 ips
- b. C-100/FR-607: 7-1/2 ips

57.3.4.1 GDS, HSK (PARKES, SYDNEY), AND MAD WILL RECORD THE COMMERCIAL FORMAT S/C TV. (BLACK AND WHITE CONVERTED TO COMMERCIAL RATE AFTER BEING CONDITIONED BY THE EIA PORTION OF THE SCAN CONVERTER.) THESE STATIONS WILL ALSO RECORD THE S/C COLOR TV. THE FOLLOWING RECORDERS AND THEIR RECORDING CAPABILITY PRESENTLY EXISTS:

- A. GDS-AMPEX VR 660 - CAN RECORD THE COMMERCIAL FORMAT TV AND COLOR TV.
 - B. HSK-AMPEX VR 1100 - CAN RECORD THE COMMERCIAL FORMAT TV AND COLOR TV.
 - C. PARKES-AMPEX VR 660 MODIFIED - CAN RECORD THE COMMERCIAL FORMAT TV, COLOR TV AND SLOW SCAN TV.
 - D. SYDNEY-AMPEX VR 660 - CAN RECORD THE COMMERCIAL FORMAT TV AND COLOR TV.
 - E. MAD-AMPEX FR 900 - CAN RECORD THE COMMERCIAL FORMAT TV, COLOR TV, AND SLOW SCAN TV.
- AT MAD AND HSK NET 1 VOICE MONITOR WILL BE RECORDED ON AUDIO CHANNEL 1.

PDC #24

57.3.3 STRIPCHART RECORDERS

57.3.3.1 All stations will record VHF signal strength in accordance with Section 57 of the NOD. Signal strength stripchart channel assignments are given in the receiver setup tables at the end of this section. Recording speed will be 10 mm/sec, and serial decimal time (SDT) will be used on both the right-and left-hand sides of the chart (except TAN where only the right side will be used). HTV and CAL will use the IRIG C timing format.

57.3.3.2 As applicable, discriminators and stripcharts will be used to aid the station in verifying the biomed remoting configuration and FM contingency remoting configurations. These charts will be used at station discretion and may be used as best fits station needs.

57.3.4 VIDEO RECORDINGS ^{ERS (PDC #24)}

57.3.4.1 ^{SEE PAGE 57-14B (PDC #24)} GDS, HBR, and MAD will record the commercial format 8/C TV (black and white) converted to commercial and color after being conditioned by the EIA portion of the sync converter on these recorders respectively: Ampex 660B, VR-1100, and FH-900. In addition, Net 1 voice monitor will be recorded on audio channel 1, AT MAD ONLY. PDC #2

57.3.4.2 Thirty-foot USB stations will not record TV unless specifically instructed to do so by TIC.

57.4 PULSE CODE DECOMMUTATION

All stations will use the formats and sequence tapes referred to in table 57-3 as applicable.

57.5 MSFTP-2 PROGRAM FORMATS

Program formats available for the MSFTP-2 are given in Section 57 of the NOD.

57.5.1 MSFTP-2 SIMULATOR AND DECOM TAPES

Tapes shown in table 57-3 are required for support of the mission. The following errata are to be used with the program tapes listed:

<u>Seq No.</u>	<u>FMT</u>	<u>Errata</u>	<u>Date</u>	<u>Purpose</u>
PDC #2 40 and 41	5 and 6	A		CSM-HBR and LBR remoting
40	1 and 2	B A		LM-HBR and LBR remoting

Note

^{EITHER}
PDC #2 | When loading errata A or B, both HBR and LBR are loaded in simultaneously. The clear function for both HBR and LBR are also loaded simultaneously. THE CSM ERRATA CAN BE USED WITH EITHER SEQ 40 OR 41

57.3.3 STRIPCHART RECORDERS

57.3.3.1 All stations will record VHF signal strength in accordance with Section 57 of the NOD. Signal strength stripchart channel assignments are given in the receiver setup tables at the end of this section. Recording speed will be 10 mm/sec, and serial decimal time (SDT) will be used on both the right- and left-hand sides of the chart (except TAN where only the right side will be used). HTV and CAL will use the IRIG C timing format.

57.3.3.2 As applicable, discriminators and stripcharts will be used to aid the station in verifying the biomed remoting configuration and FM contingency remoting configurations. These charts will be used at station discretion and may be used as best fits station needs.

57.3.4 VIDEO RECORDINGS

57.3.4.1 GDS, HSK, and MAD will record the commercial format S/C TV (black and white converted to commercial and color after being conditioned by the EIA portion of the scan converter) on these recorders respectively: Ampex 660B, VR-1100, and FR-900. In addition, Net 1 voice monitor will be recorded on audio channel 1. AT MAD ONLY PDC #2.

57.3.4.2 Thirty-foot USB stations will not record TV unless specifically instructed to do so by TIC.

57.4 PULSE CODE DECOMMUTATION

All stations will use the formats and sequence tapes referred to in table 57-3 as applicable.

57.5 MSFTP-2 PROGRAM FORMATS

Program formats available for the MSFTP-2 are given in Section 57 of the NOD.

57.5.1 MSFTP-2 SIMULATOR AND DECOM TAPES

Tapes shown in table 57-3 are required for support of the mission. The following errata are to be used with the program tapes listed:

<u>Seq No.</u>	<u>FMT</u>	<u>Errata</u>	<u>Date</u>	<u>Purpose</u>
40 and 41	5 and 6	A		CSM-HBR and LBR remoting
40	1 and 2	B, F.		LM-HBR and LBR remoting

Note

When loading errata ~~A and B~~ ^{FATHER}, both HBR and LBR are loaded in simultaneously. The clear function for both HBR and LBR are also loaded simultaneously. THE CSM ERRATA CAN BE USED WITH FATHER SEQ 40 OR 41.

SEE
NRW
PAGE

PDC #2.

Table 57-3. Decom/Simulator Formats and Tapes

Seq No.	Type	Vehicle	Formats		Format ID(s)
			MSFTP-1	MSFTP-2	
40	Decom	CSM-HBR	↑	5	06
		CSM-LBR		6	07
		CSM-HBRD		7	31
		CSM-LBRD		8	15
		CSM-HLBRD		10	33
		LM-LBRD		9	34
		LM-MLBRD		3	03
		LM-HBR		1	12
		LM-LBR		2	13
		LM-HLBRD		4	05
41	Decom	2.4 kbps	See Note 3	1	20
		S-II		2	17
		IU		3	11
		S-IVB		4	10
		CSM-HBR		5	06
		CSM-LBR		6	07
		CSM-HBRD		7	31
		CSM-LBRD		8	15
		CSM-HLBRD		10	33
43	Simulator	CSM-HBR		5	N/A
		CSM-LBR		6	N/A
44	Simulator	LM-HBR		8	N/A
		LM-LBR		9	N/A
45	Simulator	S-II		2	N/A
		IU		3	N/A
		S-IVB		4	N/A
		2.4 kbps		7	N/A
26	Simulator	CSM-HBR EMOD		5	N/A
		CSM-LBR EMOD		6	N/A
27	Simulator	LM-HBR EMOD	↓	8	N/A

Note

1. Each sequence (Seq is on a separate tape.)
2. Seq 40 CSM addresses are identical to Seq 41 CSM addresses. ~~Seq 40 LM addresses are 400 addresses below Seq 42.~~ PDC #2.
3. Stations with MSFTP-1 decoms will configure their decoms with the following formats:

<u>CSM DECOM</u>	<u>IU DECOM</u>	<u>S-IVB DECOM</u>
CSM HBR	LM HBR	CSM HBR
CSM LBR	LM LBR	CSM LBR
LM HBR	S-IVB	S-IVB
LM LBR	IU	IU

After S-IVB battery depletion, stations may remove their S-IVB and IU boards and replace them with CSM and LM boards at their option.

57.5.2 VALIDATION TAPES

Validation tapes will be used by all stations when running tests with MCC or GSFC. Information pertaining to track contents and timing sequences will be contained in a script provided for each tape. All tracks will be played back at 30 ips. The track assignments for tapes are supplied in table 57-~~5.46~~ PDC # 2

57.6 PATCHING AND PCM PROCESSING PROCEDURES

57.6.1 DSDU PATCHING

57.6.1.1 DSDU Master Patchboards. Patch two DSDU master patchboards in the following configuration:

- a. No. 1: Real-time support. MSFTP-2 decom stations will patch FM remoting DAC's so that remoting of CSM or LM data can be done in real time.
- b. No. 2: Failure of CSM decom.

57.6.1.2 USB PCM Patching. USB PCM data from the 2287.5-MHz links and the IU 2282.5-MHz link will be patched from the PM data demodulator. USB PCM data from 2272.5-MHz link will be patched from the FM data demodulator. The 2282.5-MHz LM link may be patched from the FM or PM data demodulator.

57.6.1.3 Decom Configuration. The vehicle link priorities for station decoms are listed in table 57-4 and should be adhered to unless otherwise directed by TIC or network. The decoms have not been numbered but are referred to by data name which allows the assignment of decom at the M&O option. PCM ground station assignments should be in accordance with the priority specified for each mission phase. In addition, prior to S-IVB/IU battery depletion stations will load all decoms with Seq 41; subsequent to battery depletion, and until mission termination, Seq 40 should be loaded. Where stations have more decoms than are required, the configuration of the additional decoms is also an M&O option. ~~WHEN PROCESSING CSM OR LM EMOD DATA, ALL DECOMS EXCEPT THE~~ | 151 #19
~~ACTIVE EMOD DECOM WILL BE INHIBITED FROM THE COMPUTER.~~

57.6.1.4 Signal Conditioner Configuration. Patching of narrow band or wideband band signal conditioners will be in accordance with table 57-5. In addition to table 57-5 the following will apply:

- a. Best source for IU data should be selected with VHF usually being prime.

57.5.2 VALIDATION TAPES

Validation tapes will be used by all stations when running tests with MCC or GSFC. Information pertaining to track contents and timing sequences will be contained in a script provided for each tape. All tracks will be played back at 30 ips. The track assignments for tapes are supplied in table 57-2.46. PDC #2.

57.6 PATCHING AND PCM PROCESSING PROCEDURES

57.6.1 DSDU PATCHING

57.6.1.1 DSDU Master Patchboards. Patch two DSDU master patchboards in the following configuration:

- a. No. 1: Real-time support. MSFTP-2 decom stations will patch FM remoting DAC's so that remoting of CSM or LM data can be done in real time.
- b. No. 2: Failure of CSM decom.

57.6.1.2 USB PCM Patching. USB PCM data from the 2287.5-MHz links and the IU 2282.5-MHz link will be patched from the PM data demodulator. USB PCM data from 2272.5-MHz link will be patched from the FM data demodulator. The 2282.5-MHz LM link may be patched from the FM or PM data demodulator.

57.6.1.3 Decom Configuration. The vehicle link priorities for station decoms are listed in table 57-4 and should be adhered to unless otherwise directed by TIC or network. The decoms have not been numbered but are referred to by data name which allows the assignment of decom at the M&O option. PCM ground station assignments should be in accordance with the priority specified for each mission phase. In addition, prior to S-IVB/IU battery depletion stations will load all decoms with Seq 41; subsequent to battery depletion, and until mission termination, Seq 40 should be loaded. Where stations have more decoms than are required, the configuration of the additional decoms is also an M&O option.

57.6.1.4 Signal Conditioner Configuration. Patching of narrow band or wideband band signal conditioners will be in accordance with table 57-5. In addition to table 57-5 the following will apply:

- a. Best source for IU data should be selected with VHF usually being prime.

- b. Eighty-five foot stations will input DP-1B data into both the narrowband and the wideband recorders for IU data.
- c. Should a MSFTP-1 be assigned to an LM link, the narrowband BS 307 bit sync should be used due to the probability of a long string of 0s or 1s.

Table 57-4. PCM Link Priorities

Mission Phase	Priorities			
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
<u>Launch to Insertion</u>				
MIL, BDA, ANG	S-II	IU	CSM	S-IVB
GBM, VAN	IU	CSM	S-IVB	
<u>Earth Orbit</u>				
Station uplinking to IU, and dual uplink stations	IU	CSM PM	S-IVB	CSM FM
Station uplinking to CSM	CSM PM	IU	S-IVB	CSM FM
<u>TLI Cutoff to S-IVB/IU LOS</u>				
Injection ship	IU	CSM PM	S-IVB	CSM FM
Station uplinking to CSM and dual uplink stations	CSM PM	IU	S-IVB	CSM FM
Stations uplinking to IU	IU	CSM PM	S-IVB	CSM FM
<u>Translunar Coast After S-IVB/IU LOS</u>				
Stations tracking CSM	CSM PM	CSM FM		
<u>Lunar Orbit (LM Not Powered Up)</u>				
All stations tracking	CSM PM	CSM FM	LM PM/FM	
<u>Lunar Orbit (CSM and LM Powered Up)</u>				
Station uplinking to LM and dual uplink stations	LM PM/FM	CSM PM	CSM FM	
Station uplinking to CSM after LM LOS	CSM PM	LM PM/FM	CSM FM	
<u>Transearth Coast After LM LOS</u>				
All stations tracking	CSM PM	CSM FM		
<u>Reentry</u>				
All stations tracking	CSM PM	CSM FM		

Note

During contingencies when the CSM RT PCM is switched to the FM downlink, the FM and PM downlink priorities will be reversed.

57.6.1.5 FM Biomedical Remoting

a. General Requirements. The following stations are required to remote FM (biomedical) data to MCC in real time: ACN, ANG, BDA, CRO, CYI, GBM, GDS, GWM, GYM, HAW, HSK, MAD, MER, MIL, RED, TEX, and VAN.

Table 57-5. Signal Conditioner Configurations

Mission Phases	Decom											
	CSM PM		CSM FM		LM PM/FM		IU		S-IVB		S-II	
	NB	WB	NB	WB	NB	WB	NB	WB	NB	WB	NB	WB
Launch to insertion	USB CSM PM	USB CSM FM	N/A	N/A	N/A	N/A	VHF DP-1B	USB DP-1	VHF BP-1	VHF CP-1	VHF BP-1	VHF BP-1
Earth orbit	USB CSM PM	USB CSM FM	USB CSM FM	USB CSM PM	N/A	N/A	VHF DP-1B	USB DP-1	Dump Mon- itor	VHF CP-1		
TLI cutoff to S-IVB/ IU LOS	USB CSM PM	USB CSM FM	USB CSM FM	USB CSM PM	N/A	N/A	VHF DP-1B	USB DP-1	Dump Mon- itor	CP-1 VHF		
TLC after S-IVB/IU LOS	USB CSM PM	USB CSM FM	USB CSM FM	USB CSM PM	N/A	N/A						
Lunar orbit (LM not powered up) LM & CSM powered up	USB CSM PM	USB CSM FM	USB CSM FM	USB CSM PM	USB LM	USB LM						
TEC through reentry	USB CSM PM	USB CSM FM	USB CSM FM	USB CSM PM								

↑
PDC#10

NOTE:

THE ABOVE CONFIGURATIONS WILL BE ADHERED TO UNLESS
CHANGED BY TIC OR NETWORK CONTROLLER.

151#19

1. The first of these is the fact that the...
 2. The second is the fact that the...
 3. The third is the fact that the...

4. The fourth is the fact that the...
 5. The fifth is the fact that the...
 6. The sixth is the fact that the...

Item No.	Description
1	...
2	...
3	...
4	...
5	...
6	...
7	...
8	...
9	...
10	...

The following... will be used on the...
 1. The first of these is the fact that the...
 2. The second is the fact that the...
 3. The third is the fact that the...
 4. The fourth is the fact that the...
 5. The fifth is the fact that the...
 6. The sixth is the fact that the...
 7. The seventh is the fact that the...
 8. The eighth is the fact that the...
 9. The ninth is the fact that the...
 10. The tenth is the fact that the...

b. Data Patching Procedures. The astronauts' EKG and respiration rates will be downlinked from various vehicles. Each change in the nominal configuration will be given in the SCM, and the stations will be required to patch the correct biomed data to the correct IRIG channels. EKG and respiration IRIG channel assignments are given in table 57-6, and the couch positions and associated measurement numbers are given in table 57-7. For example, a patching requirement for a particular pass might be:

(1) CM pilot is in center couch: patch CJ0061J (EKG DAC 5) to IRIG 5 and patch CJ0201J (Resp. DAC 3) to IRIG 2.

(2) LM pilot in LM: Patch 14.5 kHz (LM) to IRIG 7 (EKG). Resp. will not be patched.

(3) EVA being performed: From EMC No. 2 (~~CMDR~~) patch EKG from IRIG 9 (3.9 kHz) discriminator; EMC No. 1 (~~LMP~~) patch EKG from IRIG 10 (5.4 kHz) discriminator. (LMP)
(CMDR)

Table 57-6.

FM Biomedical Measurements

IRIG No.	Name
1*	Station ID
2	CM Pilot's Respiration
3	Commander's Respiration
4	LM Pilot's Respiration
5	CM Pilot's EKG
6	Commander's EKG
7	LM Pilot's EKG

*The following frequencies will be used on IRIG 1 for MCC station identification:

BDA = 430 Hz

CRO, HAW, CYI, RED,

GBM = 406 Hz

MER, VAN, ACN, GWM,

MIL = 394 Hz

GDS, MAD, and HSK = 400 Hz

TEX = 385 Hz

ANG and GYM = 370 Hz

At 24 hours GET, if TLI occurred, configure as follows:

All 30-foot antenna stations set IRIG 1 = 400 Hz; GDS = 385 Hz;
MAD = 370 Hz; and HSK = 430 Hz

c. DAC Outputs. MER, RED, and VAN will invert DAC outputs unless the EMR 4900 is being used.

d. SCM Notification. Before each pass, stations will receive SCM notification of the configuration for biomed remoting. This configuration will be given as a 9-digit number which will reflect the required IRIG patching (according to the astronauts' positions). Thus, the number 6/5/7/0/0/0/3/2/4 would indicate:

⁷ ⁵ ⁶ ^{LM} ^{EMR} ^{EV} ² ³ ⁴
 DAC C C C G G G C C C
 J J J T T T J J J
 0 0 0 9 8 8 0 0 0
 0 0 0 9 1 2 2 2 2
 6 6 6 9 2 2 0 0 0
 0 1 2 9 4 4 0 1 2
 J J J J J J J J J
 6 5 7 0 0 0 3 2 4

Similarly, the example given in paragraph 57.6.1.5.b (1) and (2) would be given as 0/5/0/7/0/0/2/0, or (1) and (3) 0/5/0/0/7/6/0/2/0.

e. Biomed Interface When Returning From Standby Condition A or B

(1) The configuration that site should be in will be contingent on the phase of the mission or where the astronauts are physically located and will be depicted by a time line sent out by track. However, should this not be available, contact NST/TLM and they will be able to relate what configuration the site should be testing in.

PDC # 2
 (2) The AC-16 CADFISS tape will be used for the PCM driven EKG's and respirations. The CSM-H track will be used and the tape cued at 2 minutes and 50 seconds. The tape should be started on cue from NST/TLM.

(3) The LM EKG will be simulated using the VIDAR calibrator and should be set for continuous step 5 second dwell.

(4) The EMU EKG's will be simulated using the VIDAR calibrator and should be set for continuous step 5 second dwell.

57.6.1.6 Exciter Console Patching. The following measurements will be patched by groups to the USB systems monitor in real time. The group to be used is determined by the vehicle (s) to which the USB will be uplinking:

a. Uplinking to the CSM

AGC: CSM-H and CSM-L measurement No. CT0620E from DAC 9

SPE: CSM-H measurement No. CT0640F from DAC 10

CSM decom lock. SPE will not be downlinked in the CSM-L bit stream.

Table 57-7. Measurement Number Assignments

Position	Type Meas	Vehicle	A/G Link	Meas No.	MSFTP-2 DAC	MSFTP-1 DAC	MSFTP-2 Decom Add	MSFTP-1 Decom Add
LH couch	EKG	CSM	PCM	CJ0060J	07	07	3252 5252	4, 36, 68, 100
CNTR couch	EKG	CSM	PCM	CJ0061J	05	05	3250 5250	2, 34, 66, 98
RH couch	EKG	CSM	PCM	CJ0062J	06	06	3251 5251	3, 35, 67, 99
LH couch	RESP	CSM	PCM	CJ0200J	02	02	4210	61
CNTR couch	RESP	CSM	PCM	CJ0201J	03	03	4212	90
RH couch	RESP	CSM	PCM	CJ0202J	04	04	4213	91
LM	EKG	LM	FM/FM/FM or PM (Note 1)	GT9999				
EVC (No. 1)	EKG	LM	FM/FM/FM or PM (Note 1)	GT8124				
EVC (No. 2)	EKG	LM	FM/FM/FM or PM (Note 1)	GT8224				

Note

1. The downlink frequencies for EKG from the LM and EVC positions are:

Position	FM/FM/PM or FM
LM (IRIG 13)	= 14.5 kHz/1.25 MHz/2282.5 MHz
EVC (No. 1) (IRIG 10)	= 5.4 kHz/1.25 MHz/2282.5 MHz
EVC (No. 2) (IRIG 9)	= 3.9 kHz/1.25 MHz/2282.5 MHz

2. Output filter of the LM 14.5 kHz and EVC No. 1 and 2 discriminators will be ~~30~~ 35 Hz. The delay/amplitude switch will be in the amplitude mode.

3. The calibration of all the EKG discriminators will be plus or minus 7.5 percent.

4. It should be noted that the LM and EVC EKGs can be derived only from the LM link.

Table 57-7. Measurement Number Assignments

Position	Type Meas	Vehicle	A/G Link	Meas No.	MSFTP-2 DAC	MSFTP-1 DAC	MSFTP-2 Decom Add	MSFTP-1 Decom Add
LH couch	EKG	CSM	PCM	CJ0060J	07	07	5250 5250	4,36,68,100
CNTR couch	EKG	CSM	PCM	CJ0061J	05	05	5250 5246	2,34,66,98
RH couch	EKG	CSM	PCM	CJ0062J	06	06	5251 5247	3,35,67,99
LH couch	RESP	CSM	PCM	CJ0200J	02	02	4210	61
CNTR couch	RESP	CSM	PCM	CJ0201J	03	03	4212	90
RH couch	RESP	CSM	PCM	CJ0202J	04	04	4213	91
LM	EKG	LM	FM/FM/FM or PM (Note 1)	GT9999				
EVC (No. 1)	EKG	LM	FM/FM/FM or PM (Note 1)	GT8124				
EVC (No. 2)	EKG	LM	FM/FM/FM or PM (Note 1)	GT8224				

Note

1. The downlink frequencies for EKG from the LM and EVC positions are:

Position	FM/FM/PM or FM
LM (IRIG 13)	= 14.5 kHz/1.25 MHz/2282.5 MHz
EVC (No. 1) (IRIG 10)	= 5.4 kHz/1.25 MHz/2282.5 MHz
EVC (No. 2) (IRIG 9)	= 3.9 kHz/1.25 MHz/2282.5 MHz

2. Output filter of the LM 14.5 kHz and EVC No. 1 and 2 discriminators will be ³⁵30 Hz. The delay/amplitude switch will be in the ~~DELAY~~ ¹⁵15 mode. PDC #2

3. The calibration of all the EKG discriminators will be plus or minus 7.5 percent.

4. It should be noted that the LM and EVC EKGs can be derived only from the LM link.

57.6.1.6.E.

INSTRUCTIONS FOR SETTING UP AMQ CHANNELS 12 (CSM RCVR AGC) AND CHANNEL 13 (LM RCVR AGC).

STEP 1. PRIOR TO RUNNING CALIBRATIONS WITH USB USE AN EXTERNAL PRECISION VOLTAGE SOURCE AND INSURE THAT 0VDC EQUALS 000 OCTAL AND PLUS 10 VOLTS EQUALS 377 OCTAL. (PLUS 0 COUNTS MINUS 2 COUNTS).

STEP 2. SET UP TWO EMR 4140 TUNABLE DISCRIMINATORS (TO BE USED TO DISCRIMINATE WING STATION RCVR 5 AND 7 AGC). USE THE VIDAR CALIBRATOR TO SET EACH DISCRIMINATOR.
FOR IRIG 5, INSURE THAT UBE OF IRIG 5 PRODUCES ZERO VDC AND LBE PRODUCES PLUS 10 VDC.

STEP 3. PATCH WING MIXER ONE TO THE DISCRIMINATOR ASSIGNED TO RCVR 5, PATCH WING MIXER TWO TO THE DISCRIMINATOR ASSIGNED TO RCVR 7.

THE TLM TECH SHOULD AT THIS TIME NOTIFY THE RCVR TECH THAT HE IS READY TO START THE CALIBRATIONS REQUIRED BY HOUSTON (A COMPLETE LM/CSM FOR RCVRS 1, 3, 5, AND 7 ON F-1 DAY AND AN ABBREVIATED RCVR 1 AND 5 EACH DAY THEREAFTER). WHEN INFORMED BY USB OF THE RECEIVER BEING CALIBRATED SELECT THE PROPER AMQ CHANNEL ON SELECTOR PANEL. I.E. RCVR 1 BEING CALIBRATED ON CSM INPUT RCVR 1 TO CHANNEL 12 OF THE AMQ. RELAY THE OCTAL COUNT TO THE RECEIVER TECH FOR EACH STEP. DURING THE MISSION, THE FOLLOWING WILL BE USED AS A GUIDELINE FOR SELECTING THE PROPER AGC TO AMQ CHANNEL.

1. IF THE SITE IS 2-WAY WITH THE VEHICLE, SELECT THE RCVR ASSOCIATED WITH THIS SYSTEM TO BE INPUT TO THE PROPER AMQ CHANNEL. EXAMPLE: SYSTEM 3 UPLINKING TO LM, SYSTEM 2 UPLINKING TO CSM THE FOLLOWING RCVRS WOULD BE INPUT TO THE AMQ. RCVR 3 TO AMQ CHANNEL 12, RCVR 5 TO AMQ CHANNEL 13.

2. IF THE SITE IS 3-WAY ON EITHER VEHICLE OR BOTH VEHICLES, THE RECEIVER AGC SELECTED FOR REMOTING WILL BE FROM THE RECEIVER THAT IS SUPPLYING DOPPLER DATA TO THE TRACKING DATA PROCESSOR FOR THE RESPECTIVE VEHICLE. NOMINAL CONFIGURATION WILL BE USING RECEIVERS 1 AND 5.

3. IF THE SITE IS NOT/NOT RECEIVING DATA ON EITHER PM LINK (I.E., LM NOT POWERED UP) DO NOT PATCH A RECEIVER TO THAT AMQ CHANNEL.

b. Uplinking to the S-IVB/IU

AGC: IU measurement No. J76-603 from DAC 9

SPE: IU measurement No. J75-603 from DAC 10

IU decom lock

c. Uplinking to the LM

ACC: LM-H and LM-L measurement No. GT0994V-2 from DAC 9

SPE: LM-H and LM-L measurement No. GT0992BA-2 from DAC 10

LM decom lock

d. USB AGC Signal Strength Cal (GDS, HSK, MAD)

The USB receiver AGC that is remoted to MCC via the AMQ will require calibration at least once in a 24 hour period. The details of calibration will be given in paragraph 54.3.3 and will be handled by the USB personnel. The AMQ operator will be required to stand by the AMQ and give octal readouts of the calibration points during calibration periods.

PDC#43 →

57.6.1.7 CSM and LM Downlink ID's

a. To simulate the different downlink modes for the Command Module Computer (CMC) and LM Guidance Computer (LGC), the following changes must be loaded into the CSM-HBR or LM-HBR simulator program. Both the CSM-HBR and LM-HBR programs have the Entry and Update ID programmed.

(1) CMC and LGC Powered List - ID 77774 Octal

<u>Address</u>		<u>Data</u>
CSM	LM	
1116	1140	01111111
1117	1141	11111100
1120	1142	01111110

(2) CMC and LGC Rendezvous and Prethrust - ID 77775 Octal

<u>Address</u>		<u>Data</u>
CSM	LM	
1116	1140	01111111
1117	1141	11111101
1120	1142	11111110

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b. Uplinking to the S-IVB/IU

AGC: IU measurement No. J76-603 from DAC 9
SPE: IU measurement No. J75-603 from DAC 10
IU decom lock

c. Uplinking to the LM

ACC: LM-H and LM-L measurement No. GT0994V-2 from DAC 9
SPE: LM-H and LM-L measurement No. GT0992BA-2 from DAC 10
LM decom lock

d. USB AGC Signal Strength Cal (GDS, HSK, MAD)

The USB receiver AGC that is remoted to MCC via the AMQ will require calibration at least once in a 24 hour period. The details of calibration will be given in paragraph 54.3.3 and will be handled by the USB personnel. The AMQ operator will be required to stand by the AMQ and give octal readouts of the calibration points during calibration periods.

57.6.1.7 CSM and LM Downlink ID's

a. To simulate the different downlink modes for the Command Module Computer (CMC) and LM Guidance Computer (LGC), the following changes must be loaded into the CSM-HBR or LM-HBR simulator program. Both the CSM-HBR and LM-HBR programs have the Entry and Update ID programmed.

(1) CMC and LGC Powered List - ID 77774 Octal

<u>Address</u>		<u>Data</u>
CSM	LM	
1116	1140	01111111
1117	1141	11111100
1120	1142	01111110

(2) CMC and LGC Rendezvous and Prethrust - ID 77775 Octal

<u>Address</u>		<u>Data</u>
CSM	LM	
1116	1140	01111111
1117	1141	11111101
1120	1142	11111110

SFB NEW
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(3) CMC and LGC Coast and Align - ID 77777 Octal

<u>Address</u>		<u>Data</u>
CSM	LM	
1116	1140	01111111
1117	1141	11111111
1120	1142	01111110

(4) CMD Entry and Update or LGC Initialization and Update ID 77776 Octal

<u>Address</u>		<u>Data</u>
CSM	LM	
1116	1140	01111111
1117	1141	11111110
1120	1142	11111110

(5) CMC Program 22 or LM Descent/Ascent ID 77773 Octal

<u>Address</u>		<u>Data</u>
CSM	LM	
1116	1140	01111111
1117	1141	11111011
1120	1142	11111110

(6) LGC Lunar Surface Align - ID 77772 Octal

<u>Address</u>		<u>Data</u>
	LM	
	1140	01111111
	1141	11111010
	1142	01111110

b. The LGC and CMC EMOD downlinks have separate simulation programs. The proper ID is repeated 8 times in LGC or CMC WD 1A for each of the downlinked EMOD banks in the Seq 26 and 27 programs.

Note

MSFTP-1 decom and simulator patching instructions are now located in the NOD, Section 57.

57.6.2 SPECIAL SIGNAL CONDITIONER SETUP

All LM dump data will be split phase 1.6-kbps data or variations thereof (LM-HLBR, LM-MLBR). To play this data to MCC, it is required that signal conditioners be set up as follows:

- a. If using narrowband Dynatronics Model 200, stay in program mode and auto selection will be made for 12.8 kbps and 51.2 kbps.
- b. For the wideband Dynatronics Model 200:
 - (1) Select split phase
 - (2) Select twice the bit rate of the playback desired. If playback is at 1.6, select 3.2 kbps; if playback is at 51.2, select 102.4 kbps; if playback is at 12.8 select 25.6 kbps.
- c. 219 narrowband: Not applicable
- d. 219 wideband:
 - (1) Select twice the bit rate [as in subparagraph b(2)]
 - (2) Select split phase

Note

These setups are for DSE dumped LM data only. The split phase mode must be used when playing data back or when re-moting in real time. Output level from the SDDS will be 1.5 volts for both 32:1 dump and 8:1 dump.

57.6.3 SS-13 SIMULATOR AND DDF-13 PROGRAM INSTRUCTIONS

57.6.3.1 SS-13 Simulator

- | | |
|----------------------|-----------------|
| a. Rate | <u>45 pps</u> |
| b. MF Length | <u>30</u> |
| c. SF Length | <u>999</u> |
| d. SF Location | <u>999</u> |
| e. Mode | <u>PAM/RZ +</u> |
| f. Duty Cycle | <u>50%</u> |
| g. Sync Formats | |
| (1) MF <u>IRIG 2</u> | |
| (2) SF <u>OFF</u> | |

h. Channel Assignments

- (1) Zero Ref Ch 001
- (2) F. S. Ref Ch 002
- (3) Special Ch 004
- (4) Special Data Var Ch Variable
- (5) Group $\frac{0}{1} \quad \frac{20}{2} \quad \frac{40}{3} \quad \frac{50}{4} \quad \frac{60}{5} \quad \frac{80}{6} \quad \frac{100}{7} \quad \frac{50}{8} \quad \frac{0}{9} \quad \frac{100}{10}$
- (6) Missing Channel OFF

57.6.3.2 DDF-13

a. Mode

PAM/RZ

b. Channel Rate

45 pps

c. Sync Formats

(1) PCM Frame Sync
Code111 001 000 110 111 0

(2) MF Sync

IRIG 2

(3) SF Sync

OFFd. Main Frame Format

- (1) S/L 0
- (2) Last Pulse -1 29
- (3) Last Pulse 30
- (4) Zero Ref Ch 1
- (5) F. S. Ref Ch 2

h. Channel Assignments

- | | |
|-------------------------|--|
| (1) Zero Ref Ch | <u>001</u> |
| (2) F. S. Ref Ch | <u>002</u> |
| (3) Special Ch | <u>004</u> |
| (4) Special Data Var Ch | <u>Variable</u> |
| (5) Group | $\frac{0}{1}$ $\frac{20}{2}$ $\frac{40}{3}$ $\frac{50}{4}$ $\frac{60}{5}$ $\frac{80}{6}$ $\frac{100}{7}$ $\frac{50}{8}$ $\frac{0}{9}$ $\frac{100}{10}$ |
| (6) Missing Channel | OFF |

57.6.3.2 DDF-13a. Mode PAM/RZb. Channel Rate 45 pps

c. Sync Formats

(1) PCM Frame Sync Code 111 001 000 110 111 0(2) MF Sync IRIG 2(3) SF Sync OFFd. Main Frame Format(1) S/L 0(2) Last Pulse -1 29(3) Last Pulse 30(4) Zero Ref Ch 1(5) F. S. Ref Ch 2

ISI 71

NOTE

THE SETTINGS PRESENTED IN PARAGRAPHS 57.6.3.3 AND 57.6.3.4 ARE NOMINAL SETTINGS FOR NOMINAL SIGNAL CONDITIONS. IF REQUIRED, THESE SETTINGS MAY BE ALTERED TO ACHIEVE A STABLE LOCK CONDITION. IF SETTINGS ARE ALTERED TIC WILL BE INFORMED ON NET 2 OF SETTINGS REQUIRED TO ACHIEVE A STABLE LOCK CONDITION.

STATIONS MUST CHECK WITH TIC PRIOR TO MAKING ANY DDF-13 SWITCH SETTING CHANGES.

e. Subframe Format

- (1) S/L 0
- (2) Last Pulse -1 998
- (3) Last Pulse 999
- (4) MF Location 999

Note

1.60 v = 0000000111 = 0% reference

10.0 v = 1111111000 = 100% reference

LEVEL and GAIN controls must be adjusted accordingly.

57.6.3.3 DDF-13. DDF-13 front panel switch settings not contained in program instructions.

- (1) MODE switch - PAM (+)
- (2) DATA INPUT - As required to receive IRIG 11 or 12
- (3) CHANNEL RATE - 45 pps
- (4) METER SELECT - DEV
- (5) L. E. SENS - 3
- (6) BANDWIDTH - 5
- (7) SAMPLE DELAY - 1
- (8) CALIBRATE switch - INFO
- (9) DISPLAY SELECT - As desired
- (10) METER SELECT - As desired
- (11) GAIN - As required
- (12) LEVEL - As required
- (13) SERVO GAIN switch - ON
- (14) SERVO LEVEL switch - ON

57.6.3.4 Krohn-Hite Model 3200R-2 Filter. Set LOW PASS/HIGH PASS switch to LOW PASS and set cutoff frequency to ~~360~~ Hz. PDC #24

57.6.3.5 ANYTIME THE PAM DDF-13 EQUIPMENT IS POWERED DOWN, TELEMETRY WILL NOTIFY THE COMPUTER SECTION TO SET THE PAM 1 AND 2 1299 SWITCHES TO THE NEUTRAL POSITION.

e. Subframe Format

- (1) S/L 0
- (2) Last Pulse -1 998
- (3) Last Pulse 999
- (4) MF Location 999

Note

1.60 v = 0000000111 = 0% reference

10.0 v = 1111111000 = 100% reference

LEVEL and GAIN controls must be adjusted accordingly.

57.6.3.3 DDF-13. DDF-13 front panel switch settings not contained in program instructions.

- (1) MODE switch - PAM (+)
- (2) DATA INPUT - As required to receive IRIG 11 or 12
- (3) CHANNEL RATE - 45 pps
- (4) METER SELECT - DEV
- (5) L. E. SENS - 3
- (6) BANDWIDTH - 5
- (7) SAMPLE DELAY - 1
- (8) CALIBRATE switch - INFO
- (9) DISPLAY SELECT - As desired
- (10) METER SELECT - As desired
- (11) GAIN - As required
- (12) LEVEL - As required
- (13) SERVO GAIN switch - ON
- (14) SERVO LEVEL switch - ON

57.6.3.4 Krohn-Hite Model 3200R-2 Filter. Set LOW PASS/HIGH PASS switch to LOW PASS X1 and set cutoff frequency to 500 Hz.

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N/BW
PAGE

57.6.4 FM REMOTING OF CSM AND/OR LM DATA

57.6.4.1 General. MCC may request the remoting of one or two formats of data, containing 7 or 14 parameters, via voice/data lines for evaluation. MCC may request this data in real time (during a pass), either with or instead of biomed data. Tables 57-8 (CSM) and 57-9 (LM) list the DAC assignments for MSFTP-1 and MSFTP-2 decoms for each format.

57.6.4.2 Station Configuration for Remoting of Two Formats

a. General. If two formats are required, two decoms and two mixers will be configured. Both mixer outputs will be patched to the wire room, to be remoted on two separate voice data lines to MCC via CDF tie lines.

b. Calibration Sequence for FM Remoting Formats

(1) TIC will contact the site on Net 2 giving the following information:

- (a) Vehicle
- (b) Format
- (c) Postpass or real time

(2) The following sequence of calibrations and IDs will be used by all sites. TIC will coordinate the time that the site will proceed to the next step.

Step 1: Output FM multiplexer with all VCOs at 50 percent (center frequency)

Output a 5-point calibration of all VCOs, using the MSFTP-1 simulator, MSFTP-2 manual simulator, or the internal calibrator of the VCO's. Calibrate all channels simultaneously.

Step 2: Input MSFTP-2 simulator data to the decomp.

Step 3: Output playback data or standby for real-time pass as applicable.

57.6.4.3 MSFTP-2 FM Remoting Errata Description

a. There are two separate FM errata.

(1) CSM-HBR and LBR. Formats 1 through 20 are contained on one tape. When a format is loaded or cleared, it is done for both HBR and LBR.

(2) LM-HBR and LBR. Formats 41 through ⁵⁶ are contained on one tape. When a format is loaded or cleared, it is done for both HBR and LBR.

b. To use the errata, unroll the tape to the required format and load the errata for the required format into the decomp. The first stop loads the assigned DACs to the appropriate addresses. The decomp is now configured for remoting. After remoting is complete, press LOAD TAPE P/B again to clear the DACs from the program. You should now be back in mission configuration (Decomp Program).

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- c. At the end of each errata is an "all clear" function. This function clears all DAC assignments associated with the remoting (HBR or LBR) and reassigns any normal program DACs that may have been affected by the remoting.
- d. The MSFTP-2 errata may be loaded in the operate mode.

Note

The data IDs are programmed into the simulator programs.
Use the simulator for ID source prior to remoting recorded data to MCC.

57.6.4.4 MSFTP-1 CSM or LM Distribution Board Patching Instructions. Two CSM and one LM distribution boards must be patched. The normal mission boards will be used. For CSM, one board will contain formats 1 through 10; the second board will contain formats 11 through 20. For LM, one board will contain formats 41 through 54.

57.6.4.5 Remoting Procedures

a. Stations with at Least Two MSFTP-2 Decoms (ACN, ANG, BDA, GBM, GDS, GWM, RED, MER, VAN, MIL, HSK, MAD)

- (1) For CSM remoting ensure that Seq 40 or 41 has been loaded; for LM remoting ensure that Seq 40 has been loaded
- (2) Load the appropriate contingency errata format number into the decomp
- (3) If two formats from the same vehicle are required, patch the recorder output or real-time telemetry data to both decoms being used for remoting
- (4) After remoting is complete, press LOAD TAPE pushbutton; this clears the DAC assignments.

b. Stations with at Least One MSFTP-1 and One MSFTP-2 Decom (CRO, HAW, and TEX)

- (1) Ensure that Seq 40 or 41 (for CSM) or Seq 40 (for LM) decom tape has been loaded into the MSFTP-2.
- (2) Load the appropriate errata into the MSFTP-2.

(3) If two formats are required, patch the DSDU master patchboard MSFTP-1 DAC outputs to the assigned VCOs for the second format.

(4) After remoting is complete, press the LOAD TAPE pushbutton on the MSFTP-2 to clear the DAC assignments.

c. Stations Without an MSFTP-2 Decom (CYI and GYM). Patch the DSDU master patchboard to conform to the required formats for remoting. If two formats are required, one or two decoms will be used and appropriate patches made.

57.6.4.6 Telemetry Tables. Tables 57-10 through 57-46 contain the telemetry receiver and recorder configuration.

57.7 ABORT GUIDANCE SYSTEM (AGS) PARAMETER READOUT

During AS-506 it may become necessary to read the AGS parameters within the LM data. The AGS data is located in words 126, 127, and 128 and the complete down list is 50 frames long. The AGS frames are not synchronized with the subframe counter in word 4. Once the AGS is turned on, the AGS frames are not expected to shift with respect to the word 4 frame count. To find an AGS word, the station must determine where the AGS frame count is with respect to the main frame count and then translate for a proper address. The AGS parameter readout scale is a device included to aid in making the correction.

Table 57-8. CSM Remoting Formats

Format 1											
IRIG	Measurement No.	DAC	MSFTP-2				MSFTP-1				
			HBR		LBR		HBR			LBR	
			Sim	Decom	Sim	Decom	Wd	Fr	DAC	Wd	DAC
1	CT0145F (Sec)	11	217	4252	2252	7365	62	1	11	118	11
2	CT0145F (Min)	12	220	4253	2253	7366	63	1	12	119	12
3	CG2117V	13	0055	5261			11/75	0	13		
4	CG2147V	14	0054	5260			10/74	0	14		
5	CG2177V	15	0056	5262			12/76	0	15		
6	CG3721V	16	0267	4330			55	2	16		
7	CG3722V	17	0270	4331			56	2	17		
Format 2											
IRIG	Measurement No.	DAC	MSFTP-2				MSFTP-1				
			HBR		LBR		HBR			LBR	
			Sim	Decom	Sim	Decom	Wd	Fr	DAC	Wd	DAC
1	CT0145F (Sec)	11	217	4252	2252	7365	62	1	11	118	11
2	CT0145F (Min)	12	220	4253	2253	7366	63	1	12	119	12
3	CH3500H	13	0036	4206			59	0	18		
4	CH3501H	14	0037	4207			60	0	19		
5	CH3502H	15	0057	5263			13/77	0	20		
6	CR0035P	16	0225	4260	2273	7412	72	1	21	140	13
7	CR0036P	17	0226	4261	2274	7413	73	1	22	141	14
Format 3											
IRIG	Measurement No.	DAC	MSFTP-2				MSFTP-1				
			HBR		LBR		HBR			LBR	
			Sim	Decom	Sim	Decom	Wd	Fr	DAC	Wd	DAC
1	CT0145F (Sec)	11	217	4252	2252	7365	62	1	11	118	11
2	CT0145F (Min)	12	220	4253	2253	7366	63	1	12	119	12
3	CH3503R	13	0060	5264			18/82	0	23		
4	CH3504R	14	0061	5265			19/83	0	24		
5	CH3505R	15	0062	5266			20/84	0	25		
6	CH3517H	16	0063	5267			21/85	0	26		
7	CH3518H	17	0065	5271			43/107	0	27		

Table 57-8. CSM Remoting Formats (cont)

Format 4											
IRIG	Measurement No.	DAC	MSFTP-2				MSFTP-1				
			HBR		LBR		HBR			LBR	
			Sim	Decom	Sim	Decom	Wd	Fr	DAC	Wd	DAC
1	CT0145F (Sec)	11	217	4252	2252	7365	62	1	11	118	11
2	CT0145F (Min)	12	220	4253	2253	7366	63	1	12	119	12
3	SP0022H	13	0242	4303			105	1	28		
4	SP0023H	14	0243	4304			110	1	29		
5	SP0024H	15	0244	4305			118	1	30		
6	SP0025H	16	0245	4306			119	1	31		
17	SP0001P	17	0206	4241	2201	7272	38	1	32	62	15
Format 5											
IRIG	Measurement No.	DAC	MSFTP-2				MSFTP-1				
			HBR		LBR		HBR			LBR	
			Sim	Decom	Sim	Decom	Wd	Fr	DAC	Wd	DAC
1	CT0145F (Sec)	11	217	4252	2252	7365	62	1	11	118	11
2	CT0145F (Min)	12	220	4253	2253	7366	63	1	12	119	12
3	SR5729P	13	0252	4313	2141	7214	8	2	33	20	16
4	SR5733P	14	0227	4262			78	1	34		
5	SR5737P	15	0352	4441	2315	7446	71	3	35	163	17
6	CH3666C	16	0077	5251			5-37 69-101	0	36		
7	CH3667C	17	0073	5277			53/117	0	37		
Format 6											
IRIG	Measurement No.	DAC	MSFTP-2				MSFTP-1				
			HBR		LBR		HBR			LBR	
			Sim	Decom	Sim	Decom	Wd	Fr	DAC	Wd	DAC
1	CT0145F (Sec)	11	217	4252	2252	7365	62	1	11	118	11
2	CT0145F (Min)	12	220	4253	2253	7366	63	1	12	119	12
3	SR5776P	13	0253	4314	2142	7215	9	2	38	21	18
4	SR5780P	14	0230	4263			86	1	39		
5	SR5784P	15	0354	4443	2317	7450	73	3	40	165	19
6											
7											

Table 57-8. CSM Remoting Formats (cont)

Format 7											
IRIG	Measurement No.	DAC	MSFTP-2				MSFTP-1				
			HBR		LBR		HBR			LBR	
			Sim	Decom	Sim	Decom	Wd	Fr	DAC	Wd	DAC
1	CT0145F (Sec)	11	217	4252	2252	7365	62	1	11	118	11
2	CT0145F (Min)	12	220	4253	2253	7366	63	1	12	119	12
3	SR5817P	13	0261	4322	2220	7325	38	2	41	82	20
4	SR5820P	14	0233	4266			89	1	42		
5	SR5822P	15	0400	4475	2164	7251	8	4	43	44	21
6											
7											
Format 8											
IRIG	Measurement No.	DAC	MSFTP-2				MSFTP-1				
			HBR		LBR		HBR			LBR	
			Sim	Decom	Sim	Decom	Wd	Fr	DAC	Wd	DAC
1	CT0145F (Sec)	11	217	4252	2252	7365	62	1	11	118	11
2	CT0145F (Min)	12	220	4253	2253	7366	63	1	12	119	12
3	SR5830P	13	0427	4530	2332	7463	73	4	44	181	22
4	SR5821P	14	0237	4300			102	1	59		
5	SR5823P	15	0401	4476	2165	7252	9	4	46	59	23
6	CR0003T	16	0463	4572	2257	7372	39	5	47	123	24
7	CR0004T	17	0464	4573	2260	7373	40	5	48	124	25
Format 9											
IRIG	Measurement No.	DAC	MSFTP-2				MSFTP-1				
			HBR		LBR		HBR			LBR	
			Sim	Decom	Sim	Decom	Wd	Fr	DAC	Wd	DAC
1	CT0145F (Sec)	11	217	4252	2252	7365	62	1	11	118	11
2	CT0145F (Min)	12	220	4253	2253	7366	63	1	12	119	12
3	SP0003P	13	0207	4242	2202	7273	39	1	49	63	26
4	SP0931P	14	0471	4600			56	5	50		
5	SP0661P	15	0071	5275			51/1150	0	51		
6	SP0930P	16	0460	4567			24	5	52		
7	SP0006P	17	0210	4243	2203	7274	40	1	53	64	27

Table 57-8. CSM Remoting Formats (cont)

Format 10											
IRIG	Measurement No.	DAC	MSFTP-2				MSFTP-1				
			HBR		LBR		HBR		LBR		
			Sim	Decom	Sim	Decom	Wd	Fr	DAC	Wd	DAC
1	CT0145F (Sec)	11	217	4252	2252	7365	62	1	11	118	11
2	CT0145F (Min)	12	220	4253	2253	7366	63	1	12	119	12
3	CH3582V	13	0072	5076			52/116	0	54		
4	CH3583V	14	0070	5274			50/114	0	55		
5	CH3585H	15	0045	4215			93	0	56		
6	CH3586H	16	0050	4220			122	0	57		
7	CH3587H	17	0051	4221			123	0	58		
Format 11											
IRIG	Measurement No.	DAC	MSFTP-2				MSFTP-1				
			HBR		LBR		HBR		LBR		
			Sim	Decom	Sim	Decom	Wd	Fr	DAC	Wd	DAC
1	CT0145F (Sec)	11	217	4252	2252	7365	62	1	11	118	11
2	CT0145F (Min)	12	220	4253	2253	7366	63	1	12	119	12
3	CC0232V	13	0325	4404	2145	7220	8	3	13	24	28
4	CC0210V	14	0351	4440	2314	7445	70	3	14	162	29
5	CC0206V	15	0300	4351	2277	7416	72	2	15	144	30
6	CC0207V	16	0301	4352	2300	7417	73	2	16	145	31
7	CC0211V	17	0353	4442	2316	7447	72	3	17	164	32
Format 12											
IRIG	Measurement No.	DAC	MSFTP-2				MSFTP-1				
			HBR		LBR		HBR		LBR		
			Sim	Decom	Sim	Decom	Wd	Fr	DAC	Wd	DAC
1	CT0145F (Sec)	11	217	4252	2252	7365	62	1	11	118	11
2	CT0145F (Min)	12	220	4253	2253	7366	63	1	12	119	12
3	CC0222C	13	0324	4403	2144	7217	7	3	18	23	33
4	CC0223C	14	0376	4473	2162	7247	6	4	19	42	34
5	SC2113C	15	0326	4405	2146	7221	9	3	20	25	35
6	SC2114C	16	0336	4415	2235	7344	40	3	21	100	36
7	SC2115C	17	0337	4416	2236	7345	41	3	22	101	37

Table 57-8. CSM Remoting Formats (cont)

Format 13											
IRIG	Measurement No.	DAC	MSFTP-2				MSFTP-1				
			HBR		LBR		HBR			LBR	
			Sim	Decom	Sim	Decom	Wd	Fr	DAC	Wd	DAC
1	CT0145F (Sec)	11	217	4252	2252	7365	62	1	11	118	11
2	CT0145F (Min)	12	220	4253	2253	7366	63	1	12	119	12
3	CC0224C	13	0377	4474	2163	7250	7	4	23	43	38
4	CC0215C	14	0323	4402	2143	7216	6	3	24	22	39
5	CC0200V	15	0453	4562	2177	7270	8	5	25	60	40
6	CC0203V	16	0277	4350	2270	7415	71	2	26	143	41
7	*CS0150X (see note)	17	0235	4274	2156	7234	95	1	45	38	45
	*Bit 6										
Format 14											
IRIG	Measurement No.	DAC	MSFTP-2				MSFTP-1				
			HBR		LBR		HBR			LBR	
			Sim	Decom	Sim	Decom	Wd	Fr	DAC	Wd	DAC
1	CT0145F (Sec)	11	217	4252	2252	7365	62	1	11	118	11
2	CT0145F (Min)	12	220	4253	2253	7366	63	1	12	119	12
3	CD0200V	13	0204	4237			24	1	28		
4	CD0201V	14	0202	4235			22	1	29		
5	CD0005V	15	0205	4240			25	1	30		
6	CD0006V	16	0201	4234			14	1	31		
7											

Note

For MSFTP-1 only patch bit 6 to the MSB of DAC 45 on the computer buffer patch board. Remove the DAC card from location 10A8J13 and place it in 10A8J0 (Ref. EI 1990).

Table 57-8. CSM Remoting Formats (cont)

Format 15											
IRIG	Measurement No.	DAC	MSFTP-2				MSFTP-1				
			HBR		LBR		HBR			LBR	
			Sim	Decom	Sim	Decom	Wd	Fr	DAC	Wd	DAC
1	CT0145F (Sec)	11	217	4252	2252	7365	62	1	11	118	11
2	CT0145F (Min)	12	220	4253	2253	7366	63	1	12	119	12
3	CT0015V	13	0454	4563	2200	7271	9	5	32	61	43
4	CT0016V	14	0462	4571	2256	7371	38	5	33	122	44
5	CT0017V	15	0410	4505	2240	7347	39	4	34	103	42
6	CT0018V	16	0411	4506	2241	7350	40	4	35	104	46
7	CT0262V	17	0046	4216	2346	7507	97	0	36	11	47
										31	
										51	
										71	
										91	
										111	
										131	
										151	
										171	
										191	
Format 16											
IRIG	Measurement No.	DAC	MSFTP-2				MSFTP-1				
			HBR		LBR		HBR			LBR	
			Sim	Decom	Sim	Decom	Wd	Fr	DAC	Wd	DAC
1	CT0145F (Sec)	11	217	4252	2252	7365	62	1	11	118	11
2	CT0145F (Min)	12	220	4253	2253	7366	63	1	12	119	12
3	CT0125V	13	0263	4324	2222	7327	40	2	37	84	48
4	CT0126V	14	0264	4325	2223	7330	41	2	38	85	49
5	CT0620E	15	0412	4507	2242	7351	41	4	39	105	50
6	CT0640F	16	0265	4326			46	2	40		
7	CK0028A	17	0067	5273			45/109	0	41		

Table 57-8. CSM Remoting Formats (cont)

Format 17											
IRIG	Measurement No.	DAC	MSFTP-2				MSFTP-1				
			HBR		LBR		HBR			LBR	
			Sim	Decom	Sim	Decom	Wd	Fr	DAC	Wd	DAC
1	CT0145F (Sec)	11	217	4252	2252	7365	62	1	11	118	11
2	CT0145F (Min)	12	220	4253	2253	7366	63	1	12	119	12
3	CF0003P	13	0250	4311			6	2	42		
4	CF0012P	14	0175	4230	2124	7177	6	1	43	2	51
5	CF0016P	15	0177	4232	2126	7201	8	1	44	4	52
6	CF0070P	16	465	4574	2211	7374	41	5	27	125	53
7	CF0157R	17	0341	4420			54	3	46		
Format 18											
IRIG	Measurement No.	DAC	MSFTP-2				MSFTP-1				
			HBR		LBR		HBR			LBR	
			Sim	Decom	Sim	Decom	Wd	Fr	DAC	Wd	DAC
1	CT0145F (Sec)	11	217	4252	2252	7365	62	1	11	118	11
2	CT0145F (Min)	12	220	4253	2253	7366	63	1	12	119	12
3	CK0026A	13	0064	5270			42/106	0	47		
4	CK0027A	14	0066	5272			44/108	0	48		
5	CF0070P	15	0465	4574	2261	7374	41	5	49	125	53
6	CF0035R	16	0212	4245			46	1	50		
7	CF0036P	17	0276	4347	2275	7414	70	2	51	142	54
Format 19											
IRIG	Measurement No.	DAC	MSFTP-2				MSFTP-1				
			HBR		LBR		HBR			LBR	
			Sim	Decom	Sim	Decom	Wd	Fr	DAC	Wd	DAC
1	CT0145F (Sec)	11	217	4252	2252	7365	62	1	11	118	11
2	CT0145F (Min)	12	220	4253	2253	7366	63	1	12	119	12
3	SC2060P	13	0240	4301			103	1	52		
4	SC2066P	14	0315	4374			105	2	53		
5	SC2069P	15	0320	4377			119	2	54		
6	SC2061P	16	0241	4302			104	1	55		
7	SC2067P	17	0316	4375			110	2	56		

Table 57-8. CSM Remoting Formats (cont)

Format 20											
IRIG	Measurement No.	DAC	MSFTP-2				MSFTP-1				
			HBR		LBR		Wd	HBR		LBR	
			Sim	Decom	Sim	Decom		Fr	DAC	Wd	DAC
1	CT0145F (Sec)	11	217	4252	2252	7365	62	1	11	118	11
2	CT0145F (Min)	12	220	4253	2253	7366	63	1	12	119	12
3	SC2070P	13	0321	4400			120	2	57		
4	SC2062P	14	0246	4307			120	1	58		
5	SC2068P	15	0317	4376			118	2	59		
6	SC2071P	16	0322	4401			121	2	60		
7											

Table 57-8. CSM Remoting Formats (cont)

Format 21											
IRIG	Measurement No.	DAC	MSFTP-2				MSFTP-1				
			HBR		LBR		Wd	HBR			Wd
			Sim	Decom	Sim	Decom		Fr	DAC	DAC	
1											
2											
3											
4											
5											
6											
7											
Format 22											
IRIG	Measurement No.	DAC	MSFTP-2				MSFTP-1				
			HBR		LBR		Wd	HBR			Wd
			Sim	Decom	Sim	Decom		Fr	DAC	DAC	
1											
2											
3											
4											
5											
6											
7											
Format 23											
IRIG	Measurement No.	DAC	MSFTP-2				MSFTP-1				
			HBR		LBR		Wd	HBR			Wd
			Sim	Decom	Sim	Decom		Fr	DAC	DAC	
1											
2											
3											
4											
5											
6											
7											

Table 57-9. LM Remoting Formats

Format 41											
IRIG	Measurement No.	DAC	MSFTP-2				MSFTP-1				
			HBR		LBR		Wd	HBR			LBR
			Sim	Decom	Sim	Decom		Fr	DAC	Wd	DAC
1	GH1247V-4	11	0155	0320			65	3	52		
2	GH1461V-2	12	0147	0312	2206	3303	31	3	2	47	2
3	GH1248V-2	13	0166	0331			63	4	3		
4	GH1462V-2	14	0162	0325	2212	3307	31	4	4	51	4
5	GH1249V-2	15	0130	0273			95	1	5		
6	GH1463V-2	16	0175	0340	2216	3313	31	5	6	55	6
7											
Format 42											
IRIG	Measurement No.	DAC	MSFTP-2				MSFTP-1				
			HBR		LBR		Wd	HBR			LBR
			Sim	Decom	Sim	Decom		Fr	DAC	Wd	DAC
1	GT0992BB2	11	0125	0270			63	1	7		
2	GH1313V-3	12	0163	0326			32	4	8		
3	GH1314V-4	13	0164	0327			33	4	11		
4	GH1331V-4	14	0151	0314			33	3	12		
5	GQ6806HA4	15	0061	0221			57	0	13		
6	GQ6806HB4	16	0065	0225			61	0	14		
7											
Format 43											
IRIG	Measurement No.	DAC	MSFTP-2				MSFTP-1				
			HBR		LBR		Wd	HBR			LBR
			Sim	Decom	Sim	Decom		Fr	DAC	Wd	DAC
1	GH1240V-1	11	0124	0267			62	1	15		
2	GH1241V-1	12	0133	0276			30	2	16		
3	GH1242V-1	13	0146	0311			30	3	17		
4	GH1455V-4	14	0142	0305			65	2	18		
5	GH1456V-4	15	0132	0275			97	1	19		
6	GH1457V-2	16	0140	0303			63	2	20		
7											

Table 57-9. LM Remoting Formats (cont)

Format 44											
IRIG	Measurement No.	DAC	MSFTP-2				MSFTP-1				
			HBR		LBR		HBR			LBR	
			Sim	Decom	Sim	Decom	Wd	Fr	DAC	Wd	DAC
1											
2	GG2172V-3	12	0154	0317	2207	3304	64	3	21	48	21
3	GG2173VA1	13	0161	0324			30	4	22		
4	GG2167V-2	14	1115	0715			27/91	0	23		
5	GG2167V-1	16	1120	0736			50/1140	24			
6											
7											
Format 45											
IRIG	Measurement No.	DAC	MSFTP-2				MSFTP-1				
			HBR		LBR		HBR			LBR	
			Sim	Decom	Sim	Decom	Wd	Fr	DAC	Wd	DAC
1											
2	GG2142V-2	12	0134	0327	2202	3277	31	2	25	43	25
3	GG2143VB1	13	0137	0302			62	2	26		
4	GG2137V-2	14	1117	0735			47/1110	0	27		
5	GG2137V-3	15	1113	0713			16/800	0	28		
6											
7											
Format 46											
IRIG	Measurement No.	DAC	MSFTP-2				MSFTP-1				
			HBR		LBR		HBR			LBR	
			Sim	Decom	Sim	Decom	Wd	Fr	DAC	Wd	DAC
1											
2	GG2112V-3	12	0144	0307	2204	3301	96	2	29	45	29
3	GG2113V-3	13	0141	0304	2203	3300	64	2	30	44	30
4	GG2107V-2	14	1114	0714			23/870	0	31		
5	GG2107V-1	15	1112	0712			14/780	0	32		
6											
7											

Table 57-9. LM Remoting Formats (cont)

Format 47											
IRIG	Measurement No.	DAC	MSFTP-2				MSFTP-1				
			HBR		LBR		HBR			LBR	
			Sim	Decom	Sim	Decom	Wd	Fr	DAC	Wd	DAC
1	GG2219V-4	11	0170	0333			65	4	33		
2	GG2249V-4	12	0145	0310			97	2	34		
3	GG2279V-2	13	0153	0316			63	3	35		
4	GG3304V-1	14	0165	0330			62	4	36		
5	GG3305V-3	15	0135	0300			32	2	37		
6	GG3324V-4	16	0136	0301			33	2	38		
7	GG3325V-3	17	0150	0313			32	3	39		
Format 48											
IRIG	Measurement No.	DAC	MSFTP-2				MSFTP-1				
			HBR		LBR		HBR			LBR	
			Sim	Decom	Sim	Decom	Wd	Fr	DAC	Wd	DAC
1											
2	GL0401V-3	12	0157	0221 322	2210	3305	96	3	40	49	40
3	GL0402V-3	13	0172	0335	2214	3311	96	4	41	53	41
4	GG2001V-2	14	0057	0217			55	0	42		
5	GG2021V-1	15	0056	0216			54	0	43		
6	GG2041V-3	16	0060	0220			56	0	44		
7											
Format 49											
IRIG	Measurement No.	DAC	MSFTP-2				MSFTP-1				
			HBR		LBR		HBR			LBR	
			Sim	Decom	Sim	Decom	Wd	Fr	DAC	Wd	DAC
1	GP2010PA3	11	1127	0706 0731			12-44 76-108	0	53		
2	GQ3611P-1	12	1122	0701 0724			6-38 70-102	0	46		
3	GQ4111P-1	13	1125	0704 0727			10-42 74-106	0	47		
4	GQ6510P-2	14	1126	0705 0730			11-43 75-107	0	48		
5	GQ3611P-4	15	1124	0703 0728			9-41 73-105	0	49		
6	GQ4111P-2	16	1123	0702 0725			7-39 71-103	0	50		
7											

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Table 57-9. LM Remoting Formats (cont)

Format 50											
IRIG	Measurement No.	DAC	MSFTP-2				MSFTP-1				
			HBR		LBR		HBR		LBR		
			Sim	Decom	Sim	Decom	Wd	Fr	DAC	Wd	DAC
1	GG2167V-2	11	1115	0715			27-91	0	23		
2	GG2167V-1	12	1120	0736			50-114	0	24		
3											
4	GG2137V-3	14	1113	0713			16-80	0	51		
5											
6	GG2107V-1	16	1112	0712			14-78	0	32		
7											
Format 51											
IRIG	Measurement No.	DAC	MSFTP-2				MSFTP-1				
			HBR		LBR		HBR		LBR		
			Sim	Decom	Sim	Decom	Wd	Fr	DAC	Wd	DAC
1											
2	GG2172V-3	12	0154	0317	2207	3304	64	3	21	48	21
3											
4	GG2142V-2	14	0134	0317 0277	2202	3277	31	2	25	43	25
5											
6	GG2112V-3	16	0144	0307	2204	3301	96	2	29	45	29
7											
Format 52											
IRIG	Measurement No.	DAC	MSFTP-2				MSFTP-1				
			HBR		LBR		HBR		LBR		
			Sim	Decom	Sim	Decom	Wd	Fr	DAC	Wd	DAC
1	GG2172V-3	11	0154	0317	2207	3304	64	3	21	48	21
2	GG2173VA1	12	0161	0324			30	4	22		
3	GG2142V-2	13	0134	0277	2202	3277	31	2	25	43	25
4	GG2143VB1	14	0137	0302			62	2	26		
5	GG2112V-3	15	0144	0307	2204	3301	96	2	29	45	29
6	GG2113V-3	16	0141	0304	2203	3300	64	2	30	44	30
7											

Table 57-9. LM Remoting Formats (cont)

Format 53											
IRIG	Measurement No.	DAC	MSFTP-2				MSFTP-1				
			HBR		LBR		Wd	HBR		LBR	
			Sim	Decom	Sim	Decom		Fr	DAC	Wd	DAC
1	GH1247V-4	11	0155	0320			65	3	52		
2	GH1455V-4	12	0142	0305			65	2	18		
3	GH1248V-2	13	0166	0331			63	4	3		
4	GH1456V-4	14	0132	0275			97	1	19		
5	GH1249V-2	15	0130	0273			95	1	5		
6	GH1457V-2	16	0140	0308			63	2	20		
7				0303							
Format 54											
IRIG	Measurement No.	DAC	MSFTP-2				MSFTP-1				
			HBR		LBR		Wd	HBR		LBR	
			Sim	Decom	Sim	Decom		Fr	DAC	Wd	DAC
1	GH1240V-1	11	0124	0267			62	1	15		
2	GH1241V-1	12	0133	0276			30	2	16		
3	GH1242V-1	13	0146	0311			30	3	17		
4											
5											
6											
7											
Format 55											
IRIG	Measurement No.	DAC	MSFTP-2				MSFTP-1				
			HBR		LBR		Wd	HBR		LBR	
			Sim	Decom	Sim	Decom		Fr	DAC	Wd	DAC
1	GP0001P-1	11	1040	0663	2414	3555	98	46	53	181	53
2	GP0002P-2	12	0541	0470	2266	3371	34	25	54		
3	GP0018P-2	13	0452	0462			34	19	55		
4	GP0025P-3	14	0333	0534	2173	3264	66	10	56	36	56
5	GP1501P-2	15	0430	0460	2226	3323	34	17	57	63	57
6	GP1503P-2	16	0573	0473	2302	3407	34	28	58	107	58
7	GP2010PA3	17	1127	0706 0731			12-44 76-108	00	45		

Table 57-9. LM Remoting Formats (cont)

Format 56											
IRIG	Measurement No.	DAC	MSFTP-2				MSFTP-1				
			HBR		LBR		HBR			LBR	
			Sim	Decom	Sim	Decom	Wd	Fr	DAC	Wd	DAC
1	GQ3015P-3	11	0344	0535			66	11	59		
2	GQ3435P-1	12	0312	0615	2164	3255	98	08	60	29	60
3	GQ3018P-4	13	0352	2573	2201	3076	02	12	61	42	61
4	GQ3611P-1	14	1122	0701 0724			06-38 70-102 10-42		00	46	
5	GQ4111P-1	15	1125	0704 0727			74-106	00	47		
6	GQ6806HA4	16	0061	0221			57	00	13		
7	GQ6510P-2	17	1126	0705 0730			11-43 75-107	00	48		

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Format 57											
IRIG	Measurement No.	DAC	MSFTP-2				MSFTP-1				
			HBR		LBR		HBR			LBR	
			Sim	Decom	Sim	Decom	Wd	Fr	DAC	Wd	DAC
1											
2											
3											
4											
5											
6											
7											

Format 58											
IRIG	Measurement No.	DAC	MSFTP-2				MSFTP-1				
			HBR		LBR		HBR			LBR	
			Sim	Decom	Sim	Decom	Wd	Fr	DAC	Wd	DAC
1											
2											
3											
4											
5											
6											
7											

Table 57-11. Telemetry Recorder Setup for ACN

T R K	MCC Recorder No. 1	DSS No. 630 (M-22)	Mode	T R K	MSFC (Note) Recorder No. 2	DSS No. 631 (M-22)	Mode
1	TLM Mixer No. 1		Dir	1	TLM Mixer No. 1		Dir
2	USB CMD Ver Rcvr No. 1		FM	2	USB CMD Ver Rcvr No. 1		FM
3	USB CMD Ver Rcvr No. 2		FM	3	USB CMD Ver Rcvr No. 2		FM
4	2287.5 TLM Video		FM	4			
5	36-Bit BCD on 1 kHz		Dir	5	36-Bit BCD on 1 kHz		Dir
6	2272.5 TV recorded FM or Voice recorded Dir			6	258.5 Pre-D Comb.	CP-1	Dir
7	2282.5 LM TLM Video		FM	7	2282.5 IU TLM Video	DP-1B	FM
8	2272.5 TLM Demod Output		FM	8	250.7 Pre-D Comb.	DF-1	Dir
9	LM EKG		Dir	9	USB TDP Data Modem		Dir
10	USB Mixer and Cycle Lock		Dir	10	USB Mixer and Cycle Lock		Dir
11	2272.5 LM S \emptyset Dump		FM	11	245.3 Pre-D Comb.	DP-1	Dir
12	TLM Data Modem No. 1		Dir	12			
13	TLM Data Modem No. 2		Dir	13			
14	TLM Data Mixer No. 2		Dir	14	TLM Mixer No. 2		Dir
T R K	Recorder No. 3		Mode	T R K	Recorder No. 4		Mode
1				1			
2				2			
3				3			
4				4			
5				5			
6				6			
7				7			
8				8			
9				9			
10				10			
11				11			
12				12			
13				13			
14				14			

Table 57-12. Telemetry Receiver Configuration for ANG

Link	Vehicle	Rcvr Type	Ant/Rcvr No.		Rcvr Front Panel Setting				Ships		AGC S/S Mixers			AGC S/S Strip Chart Rcdr		
			LHC	RHC	0°	90°	Freq (MHz)	IF/Comb BW (kHz)	Video Fil BW (kHz)	AGC Type	Demod Type	Mix 1 IRIG	Mix 2 IRIG	Mix 3 IRIG	Rcdr 1 Pen No.	Rcdr 2 Pen No.
DF-1	IU	2074		X	X	250.7	500	300				12A	12B		3	4
DP-1	IU	2074		X	X	245.3	300	100				13A	13B		5	6
CP-1	S-IVB	2074		X	X	258.5	300	100				14A	14B		7	8
BP-1	S-II	2074		X	X	248.6	300	100				11A	11B		1	2
BF-1	S-II	1455		X		241.5	500	300				10A			3	
BF-2	S-II	1455		X		234.0	500	300				9A			5	

Table 57-13. Telemetry Recorder Setup for ANG

T R K	MCC DSS No. 630 Recorder No. 1 (M-22)	Mode	T R K	MSFC DSS No. 631 Recorder No. 2 (M-22)	Mode
1	TLM Mixer No. 1	Dir	1	TLM Mixer No. 1	Dir
2	USB CMD Ver Rcvr No. 1	FM	2	USB CMD Ver Rcvr No. 1	FM
3	USB CMD Ver Rcvr No. 2	FM	3	USB CMD Ver Rcvr No. 2	FM
4	2287.5 TLM Video	FM	4		
5	36-Bit BCD on 1 kHz	Dir	5	36-Bit BCD on 1 kHz	Dir
6	2272. TV Rcdr FM or Voice Rcvr Dir		6	258.5 Pre-D Comb. CP-1	Dir
7	2282.5 LM TLV Video	FM	7	2282.5 IU TLM Video DP-1B	FM
8	2272.5 TLM Demod Output	FM	8	250.7 Pre-D Comb. DF-1	Dir
9	LM EKG	Dir	9	USB TDP Data Modem	Dir
10	USB Mixer and Cycle Lock	Dir	10	USB Mixer and Cycle Lock	Dir
11	2272.5 LM SØ Dump	FM	11	245.3 Pre-D Comb. DP-1	Dir
12	TLM Data Modem No. 1	Dir	12		
13	TLM Data Modem No. 2	Dir	13		
14	TLM Mixer No. 2	Dir	14	TLM Mixer No. 2	Dir
T R K	MSFC (Launch Phase Only) DSS No. 632 Recorder No. 3 (M-22)	Mode	T R K	Recorder No. 4	Mode
1	TLM Mixer No. 1	Dir	1		
2			2		
3			3		
4			4		
5	36-Bit BCD on 1 kHz	Dir	5		
6	2287.5 TLM Video	FM	6		
7	241.5 Video BF-1	Dir	7		
8	234.0 Video BF-2	Dir	8		
9	248.6 Pre-D Comb. BP-1	Dir	9		
10	USB Mixer and Cycle Lock	Dir	10		
11			11		
12			12		
13			13		
14	TLM Mixer No. 2	Dir	14		

Table 57-14. Telemetry Receiver Configuration for BDA

Link	Vehicle	Rcvr Type	Ant/Rcvr No.		Rcvr Front Panel Setting				Ships		AGC S/S Mixers			AGC S/S Strip Chart Rcdr		
			LHC	RHC	0°	90°	Freq (MHz)	IF/Comb BW (kHz)	Video Fil BW (kHz)	AGC	Demod Type	Mix 1 ITRIG	Mix 2 ITRIG	Mix 3 ITRIG	Rcdr 1 Pen No.	Rcdr 2 Pen No.
DF-1	IU	2074	X	X	X	X	250.7	500	300			12A	12B		3	4
DP-1	IU	2074	X	X	X	X	245.3	300	100			13A	13B		5	6
CP-1	S-IVB	2074	X	X	X	X	258.5	300	100			14A	14B		7	8
(Note 1) BP-1	S-II	2074	X	X	X	X	248.6	300	100			11A	11B		1	2
(Note 1) BF-1	S-II	2074	X	X	X	X	241.5	500	300			10A	10B		3	4
(Note 1) BF-2	S-II	2074	X	X	X	X	234.0	500	300			9A	9B		5	6

Table 57-15. Telemetry Recorder Setup for BDA

T R K	MCC Recorder No. 1 (M-22)	DSS No. 630 Mode	T R K	MSFC Recorder No. 2 (VR 3600)	DSS No. 631 Mode
1	TLM Mixer No. 1	Dir	1	TLM Mixer No. 1	Dir
2	USB CMD Ver Rcvr No. 1	FM	2	USB CMD Ver Rcvr No. 1	FM
3	USB CMD Ver Rcvr No. 2	FM	3	USB CMD Ver Rcvr No. 2	FM
4	2287.5 TLM Video	FM	4		
5	36-Bit BCD on 1 kHz	Dir	5	36-Bit BCD on 1 kHz	FM
6	2272.5 TV Rcdr FM or Voice Rcdr Dir		6	258.5 Pre-D Comb. CP-1	Dir
7	2282.5 LM TLM Video	FM	7	2282.5 IU TLM Video DP-1B	FM
8	2272.5 TLM Demod Output	FM	8	250.7 Pre-D Comb. DF-1	Dir
9	LM EKG	Dir	9	USB TDP Data Modem	Dir
10	USB Mixer and Cycle Lock	Dir	10	USB Mixer and Cycle Lock	Dir
11	2272.5 LM S ϕ Dump	FM	11	245.3 Pre-D Comb. DP-1	Dir
12	TLM Data Modem No. 1	Dir	12		
13	TLM Data Modem No. 2	Dir	13		
14	TLM Mixer No. 2	Dir	14	TLM Mixer No. 2	Dir
T R K	(Note) MSFC Recorder No. 3 (M-22)	DSS No. 632 Mode	T R K	Recorder No. 4	Mode
1	TLM Mixer No. 1	Dir	1		
2			2		
3			3		
4			4		
5	36-Bit BCD on 1 kHz	Dir	5		
6	2287.5 TLM Video	FM	6		
7	241.5 Pre-D Comb. BF-1	Dir	7		
8	234.0 Pre-D Comb. BF-2	Dir	8		
9	248.6 Pre-D Comb. BF-1	Dir	9		
10	USB Mixer and Cycle Lock	Dir	10		
11	UHF CMD Ver Rcvr	Dir	11		
12			12		
13			13		
14	TLM Mixer No. 2	Dir	14		

Table 57-16. Telemetry Receiver Configuration for CRO

Link	Vehicle	Rcvr Type	Ant/Rcvr No.		Rcvr Front Panel Setting				Ships		AGC S/S Mixers			AGC S/S Strip Chart Rcdr	
			Config	No.	Freq (MHz)	IF/Comb BW (kHz)	Video Fil BW (kHz)	AGC	Demod Type	Mix 1 IRIG	Mix 2 IRIG	Mix 3 IRIG	Rcdr 1 Pen No.	Rcdr 2 Pen No.	
															LHC
DF-1	IU	2074		X	X	250.7	500	300			12A	12B	3	4	
DP-1	IU	2074		X	X	245.3	300	100			13A	13B	5	6	
CP-1	S-IVB	2074		X	X	258.5	300	100			14A	14B	7	8	
											</				

Table 57-17. Telemetry Recorder Setup for CRO

T R K	MCC Recorder No. 1 DSS No. 630 (M-22)	Mode	T R K	MSFC Recorder No. 2 (Note) DSS No. 631 (VR-3600)	Mode
1	TLM Mixer No. 1	Dir	1	TLM Mixer No. 1	Dir
2	USB CMD Ver Rcvr No. 1	FM	2	USB CMD Ver Rcvr No. 1	FM
3	USB CMD Ver Rcvr No. 2	FM	3	USB CMD Ver Rcvr No. 2	FM
4	2287.5 TLM Video	FM	4		
5	36-Bit BCD on 1 kHz	Dir	5	36-Bit BCD on 1 kHz	Dir
6	2272.5 TV Rcdr FM, Voice Rcdr Dir		6	258.5 Pre-D Comb. CP-1	Dir
7	2282.5 LM TLM Video	FM	7	2282.5 IU TLM Video DP-1B	FM
8	2272.5 TLM Demod Output	FM	8	250.7 Pre-D Comb. DF-1	Dir
9	LM EKG	Dir	9	USB TDP Data Modem	Dir
10	USB Mixer and Cycle Lock	Dir	10	USB Mixer and Cycle Lock	Dir
11	2272.5 LM SØ Dump	FM	11	245.3 Pre-D Comb. DP-1	Dir
12	TLM Data Modem No. 1	Dir	12		
13	TLM Data Modem No. 2	Dir	13	2287.5 TLM Video	FM
14	TLM Mixer No. 2	Dir	14	TLM Mixer No. 2	Dir
T R K	Recorder No. 3	Mode	T R K	Recorder No. 4	Mode
1			1		
2			2		
3			3		
4			4		
5			5		
6			6		
7			7		
8			8		
9			9		
10			10		
11			11		
12			12		
13			13		
14			14		

Table 57-18. Telemetry Receiver Configuration for CYI

Link	Vehicle	Rcvr Type	Ant/Rcvr No.		Rcvr Front Panel Setting				Ships		AGC S/S Mixers			AGC S/S Strip Chart Rcdr	
			Config	Linear	Freq (MHz)	IF/Comb BW (kHz)	Video Fil BW (kHz)	Demod AGC Type	Mix 1 IRIG	Mix 2 IRIG	Mix 3 IRIG	Rcdr 1 Pen No.	Rcdr 2 Pen No.		
														LHC	RHC
DF-1	IU	2074	X	X	250.7	500	300			12A	12B		3	4	
DP-1	IU	2074	X	X	245.3	300	100			13A	13B		5	6	
CP-1	S-IVB	2074	X	X	258.5	300	100			14A	14B		7	8	

Table 57-19. Telemetry Recorder Setup for CYI

T R K	MCC Recorder No. 1 DSS No. 630 (M-22)	Mode	T R K	MSFC Recorder No. 2 DSS No. 631 (VR-3600)	Mode
1	TLM Mixer No. 1	Dir	1	TLM Mixer No. 1	Dir
2	USB CMD Ver Rcvr	FM	2	USB CMD Ver Rcvr	FM
3			3		
4	2287.5 TLM Video	FM	4		
5	36-Bit BCD on 1 kHz	Dir	5	36-Bit BCD on 1 kHz	Dir
6	TV Rcvr FM or 2272.5 Voice Rcvr Dir		6	258.5 Pre-D Comb. CP-1	Dir
7	2282.5 LM TLM Video	FM	7	2282.5 IU TLM Video DP-1B	FM
8	2272.5 TLM Demod Output	FM	8	250.7 Pre-D Comb. DF-1	Dir
9	LM EKG	Dir	9	USB TDP Data Modem	Dir
10	USB Mixer and Cycle Lock	Dir	10	USB Mixer and Cycle Lock	Dir
11	2272.5 LM S \emptyset Dump	FM	11	245.3 Pre-D Comb. DP-1	Dir
12	TLM Data Modem No. 1	Dir	12		
13	TLM Data Modem No. 2	Dir	13		
14	TLM Mixer No. 2	Dir	14	TLM Mixer No. 2	Dir
T R K	MCC Recorder No. 3 DSS No. 632 (M-22)	Mode	T R K	Recorder No. 4	Mode
1	Patch redundant to rcdr No. 1 and		1		
2	operate simultaneously with rcdr		2		
3	No. 1 up to TLI.		3		
4			4		
5			5		
6			6		
7			7		
8			8		
9			9		
10			10		
11			11		
12			12		
13			13		
14			14		

Table 57-20. Telemetry Receiver Configuration for GBM

Link	Vehicle	Rcvr Type	Ant/Rcvr No.		Rcvr Front Panel Setting				Ships		AGC S/S Mixers			AGC S/S Strip Chart Rcdr	
			LHC	RHC	O°	Freq (MHz)	IF/Comb BW (kHz)	Video Fil BW (kHz)	AGC	Demod Type	Mix 1 IRIG	Mix 2 IRIG	Mix 3 IRIG	Rcdr 1 Pen No.	Rcdr 2 Pen No.
DF-1	IU	1455	X	X	250.7	500	300				12		3		
DP-1	IU	1455	X	X	245.3	300	100				13		4		
CP-1	S-IVB	1455	X	X	258.5	300	100				14		5		
AF-1	S-I	1455	X	X	256.2	500	300				7		6		
AP-1	S-I	1455	X	X	244.3	300	100				8		7		
BF-1	S-II	1455	X	X	241.5	500	300				10		8		
BF-2	S-II	1455	X	X	234.0	500	300				9		1		
BP-1	S-II	1455	X	X	248.6	300	100				11		2		
VHF	CSM	A/G			296.8/ 259.7										
VHF	CSM	A/G			296.8/ 259.7										

Legend

△ Voice annotation on IRIG 18, M&O loop on IRIG 17, 100-kHz reference, and the biomed mixer output

② 36-Bit BCD/1 kHz on IRIG 18, Net 1 on IRIG 17, and SDT/1 kHz on IRIG 16

Note

See paragraph 57.3.3 for stripchart operations.

Table 57-21. Telemetry Recorder Setup for GBM

T R K	MCC Recorder No. 1 DSS No. 630 (M-22)	Mode	T R K	MSFC Recorder No. 2 DSS No. 631 (M-22)	Mode
1	TLM Mixer No. 1	Dir	1	TLM Mixer No. 1	Dir
2	USB CMD Ver Rcvr No. 1	FM	2	USB CMD Ver Rcvr No. 1	FM
3			3	256.2 Video AF-1	Dir
4	2287.5 TLM Video	FM	4	244.3 Video AP-1	FM
5	36-Bit BCD on 1 kHz	Dir	5	248.6 Video RHC BP-1	FM
6	2272.5 TV Rcdr Fm or Voice Rcdr Dir		6	258.5 Video RHC CP-1	FM
7	2282.5 LM TLM Video	FM	7	2282.5 IU TLM Video DP-1B	FM
8	2272.5 TLM Demod Output	FM	8	250.7 Video RHC DF-1	Dir
9	LM EKG FM	Dir	9	USB TDP Data Modem	Dir
10	USB Mixer and Cycle Lock	Dir	10	USB Mixer and Cycle Lock	Dir
11	2272.5 MHz LM SØ	FM	11	245.3 Video RHC DP-1	FM
12	TLM Data Modem No. 1	Dir	12	241.5 Video RHC BF-1	Dir
13	TLM Data Modem No. 2	Dir	13	234.0 Video RHC BF-2	Dir
14	TLM Mixer No. 2	Dir	14	TLM Mixer No. 2	Dir
T R K	Recorder No. 3	Mode	T R K	Recorder No. 4	Mode
1			1		
2			2		
3			3		
4			4		
5			5		
6			6		
7			7		
8			8		
9			9		
10			10		
11			11		
12			12		
13			13		
14			14		

Table 57-22. Telemetry Receiver Configuration for GWM

Link	Vehicle	Rcvr Type	Ant/Rcvr No.		Rcvr Front Panel Setting				Ships		AGC S/S Mixers			AGC S/S Strip Chart Rcdr	
			LHC	Linear 0° 90° RHC	Freq (MHz)	IF/Comb BW (kHz)	Video Fil BW (kHz)	AGC Type		Mix 1 IRIG	Mix 2 IRIG	Mix 3 IRIG	Rcdr 1 Pen No.	Rcdr 2 Pen No.	
								Demod	Type						
DF-1	IU	2074	X	X	250.7	500	300				12A	12B		3	4
DP-1	IU	2074	X	X	245.3	300	100				13A	13B		5	6
CP-1	S-IVB	2074	X	X	258.5	300	100				14A	14B		7	8

Table 57-23. Telemetry Recorder Setup for GWM

T R K	MCC DSS No. 630 Recorder No. 1 (M-22)	Mode	T R K	MSFC DSS No. 631 Recorder No. 2 (M-22)	Mode
1	TLM Mixer No. 1	Dir	1	TLM Mixer No. 1	Dir
2	USB CMD Ver Rcvr No. 1	FM	2	USB CMD Ver Rcvr No. 1	FM
3	USB CMD Ver Rcvr No. 2		3	USB CMD Ver Rcvr No. 2	FM
4	2287.5 TLM Video	FM	4		
5	36-Bit BCD on 1 kHz	Dir	5	36-Bit BCD on 1 kHz	Dir
6	TV Rcdr FM or 2272.5 Voice Rcdr DIR		6	258.5 Pre-D Comb. CP-1	Dir
7	2282.5 LM TLM Video	FM	7	2282.5 IU TLM Video DP-1B	FM
8	2272.5 TLM Demod Output	FM	8	250.7 Pre-D Comb. DF-1	Dir
9	LM EKG	Dir	9	USB TDP Data Modem	Dir
10	USB Mixer and Cycle Lock	Dir	10	USB Mixer and Cycle Lock	Dir
11	2272.5 LM SØ Dump	FM	11	245.3 Pre-D Comb. DP-1	Dir
12	TLM Data Modem No. 1	Dir	12		
13	TLM Data Modem No. 2	Dir	13		
14	TLM Mixer No. 2	Dir	14	TLM Mixer No. 2	Dir
T R K	Recorder No. 3	Mode	T R K	Recorder No. 4	Mode
1			1		
2			2		
3			3		
4			4		
5			5		
6			6		
7			7		
8			8		
9			9		
10			10		
11			11		
12			12		
13			13		
14			14		

Table 57-24. Telemetry Receiver Configuration for GYM

Link	Vehicle	Rcvr Type	Ant/Rcvr No.		Rcvr Front Panel Setting						Ships		AGC S/S Mixers			AGC S/S Strip Chart Rcdr	
			Config LHC	Linear	Freq (MHz)	IF/Comb BW (kHz)	Video Fil BW (kHz)	Demod AGC Type	Mix 1 IRIG	Mix 2 IRIG	Mix 3 IRIG	Rcdr 1 Pen No.	Rcdr 2 Pen No.				
														O°	90°		
DF-1 IU		2074		X	250.7	500	300				12A	12B		3	4		
DP-1 IU		2074		X	245.3	300	100				13A	13B		5	6		
CP-1 S-IVB		2074		X	258.5	300	100				14A	14B		7	8		
															</		

Table 57-25. Telemetry Recorder Setup for GYM

T R K	MCC Recorder No. 1 (M-22)	DSS No. 630 Mode	T R K	MSFC Recorder No. 2 (VR-3600)	DSS No. 631 Mode
1	TLM Mixer No. 1	Dir	1	TLM Mixer No. 1	Dir
2	USB CMD Ver Rcvr	FM	2	USB CMD Ver Rcvr No. 1	FM
3			3		
4	2287.5 TLM Video	FM	4		
5	36-Bit BCD on 1 kHz	Dir	5	36-Bit BCD on 1 kHz	Dir
6	2272.5 TV Rcdr FM or Voice Rcdr Dir		6	258.5 Pre-D Comb. CP-1	Dir
7	2282.5 LM TLM Video	FM	7	2282.5 IU TLM Video DP-1B	FM
8	2272.5 TLM Demod Output	FM	8	250.7 Pre-D Comb. DF-1	Dir
9	LM EKG	Dir	9	USB TDP Data Modem	Dir
10	USB Mixer and Cycle Lock	Dir	10	USB Mixer and Cycle Lock	Dir
11	2272.5 MHz LM SØ Dump	FM	11	245.3 Pre-D Comb. DP-1	Dir
12	TLM Data Modem No. 2	Dir	12		
13	TLM Data Modem No. 2	Dir	13		
14	TLM Mixer No. 2	Dir	14	TLM Mixer No. 2	Dir
T R K	MCC Recorder No. 3 (M-22)	DSS No. 632 Mode	T R K	Recorder No. 4	Mode
1	Patch redundant to and operate		1		
2	simultaneously with recorder No.		2		
3	through TLI.		3		
4			4		
5			5		
6			6		
7			7		
8			8		
9			9		
10			10		
11			11		
12			12		
13			13		
14			14		

Table 57-26. Telemetry Receiver Configuration for HAW

Link	Vehicle	Rcvr Type	Ant/Rcvr No.		Rcvr Front Panel Setting				Ships		AGC S/S Mixers			AGC S/S Strip Chart Rcdr		
			LHC	RHC	0°	90°	Freq (MHz)	IF/Comb BW (kHz)	Video Fil BW (kHz)	AGC Type	Demod	Mix 1 IRIG	Mix 2 IRIG	Mix 3 IRIG	Rcdr 1 Pen No.	Rcdr 2 Pen No.
DF-1	IU	2074		X	X	250.7	500	300				12A	12B		3	4
DP-1	IU	2074		X	X	245.3	300	100				13A	13B		5	6
CP-1	S-IVB	2074		X	X	258.5	300	100				14A	14B		7	8
				</												

Table 57-27. Telemetry Recorder Setup for HAW

T R K	MCC Recorder No. 1 DSS No. 630 (M-22)	Mode	T R K	MSFC Recorder No. 2 DSS No. 631 (VR-3600)	Mode
1	TLM Mixer No. 1	Dir	1	TLM Mixer No. 1	Dir
2	USB CMD Ver Rcvr No. 1	FM	2	USB CMD Ver Rcvr No. 1	FM
3	USB CMD Ver Rcvr No. 2	FM	3	USB CMD Ver Rcvr No. 2	FM
4	2287.5 TLM Video	FM	4		
5	36-Bit BCD on 1 kHz	Dir	5	36-Bit BCD on 1 kHz	Dir
6	2272.5 TV Redr FM or Voice Redr Dir		6	258.5 Pre-D Comb. CP-1	Dir
7	2282.5 LM TLM Video	FM	7	2282.5 IU TLM Video DP-1B	FM
8	2272.5 TLM Demod Output	FM	8	250.7 Pre-D Comb. DF-1	Dir
9	LM EKG	Dir	9	USB TDP Data Modem	Dir
10	USB Mixer and Cycle Lock	Dir	10	USB Mixer and Cycle Lock	Dir
11	2272.5 LM SØ Dump	FM	11	245.3 Pre-D Comb. DP-1	Dir
12	TLM Data Modem No. 1	Dir	12		
13	TLM Data Modem No. 2	Dir	13		
14	TLM Mixer No. 2	Dir	14	TLM Mixer No. 2	Dir
T R K	MCC Recorder No. 3 DSS No. 632 (M-22)	Mode	T R K	Recorder No. 4	Mode
1	Patch redundant to redr No. 1 and		1		
2	run simultaneously up to TLI		2		
3			3		
4			4		
5			5		
6			6		
7			7		
8			8		
9			9		
10			10		
11			11		
12			12		
13			13		
14			14		

Table 57-28. Telemetry Receiver Configuration for MIL

Link	Vehicle	Rcvr Type	Ant/Rcvr No.		Rcvr Front Panel				Ships		AGC S/S Mixers			AGC S/S Strip Chart Rcdr	
			LHC	RHC	O°	90°	Freq (MHz)	IF/Comb BW (kHz)	Video Fil BW (kHz)	Demod AGC Type	Mix 1 IRIg	Mix 2 IRIg	Mix 3 IRIg	Rcdr 1 Pen No.	Rcdr 2 Pen No.
DF-1	IU	1071	X				250.7	500	300			12		3	
DP-1	IU	2074			X	X	245.3	300	100		13A	13B		5	6
CP-1	S-IVB	2074			X	X	258.5	300	100		14A	14B		7	8
BF-1	S-II	1071	X				241.5	500	300			10			1
BF-2	S-II	1071	X				234.0	500	300			9			2
BP-1	S-II	2074			X	X	248.6	300	100		11A	11B		3	4
AF-1	S-IC	1071	X				256.2	500	300			7			5
AP-1	S-IC	2074			X	X	244.3	300	100		8A	8B		6	7
VHF	CSM	A/G					296.8/ 259.7								
VHF	CSM	A/G					296.8/ 259.7								

Legend

△ Voice annotation on IRIg 18, M&O on IRIg 17, 100-kHz reference, and blomed mixer output
 ② 36-Bit BCD/1 kHz on IRIg 18, Net 1 on IRIg 17, and SDT/1 kHz on IRIg 16

Notes

1. S-I and S-II links required for launch only
2. See para. 57.3.3 for stripchart operation

Table 57-29. Telemetry Recorder Setup for MIL

T R K	MCC DSS No. 630 Recorder No. 1 (M-22)	Mode	T R K	MSFC DSS No. 631 Recorder No. 2 (VR-3600)	Mode
1	TLM Mixer No. 1	Dir	1	TLM Mixer No. 1	Dir
2	USB CMD Ver Rcvr No. 1	FM	2	USB CMD Ver Rcvr No. 1	FM
3	USB CMD Ver Rcvr No. 2	FM	3	USB CMD Ver Rcvr No. 2	FM
4	2287.5 TLM Video	FM	4		
5	36-Bit BCD on 1 kHz	Dir	5	36-Bit BCD on 1 kHz	Dir
6	TV Rcdr FM or Voice 2272.5 Rcdr Dir		6	258.5 Pre-D Comb. CP-1	Dir
7	2232.5 LM TLM Video	FM	7	2282.5 IU TLM Video DP-1B	FM
8	2272.5 TLM Demod Output	FM	8	250.7 Pre-D DF-1	Dir
9	LM EKG	Dir	9	USB TDP Data Modem	Dir
10	USB Mixer and Cycle Lock	Dir	10	USB Mixer and Cycle Lock	Dir
11	2272.5 MHz LM SØ Dump / 2287.5 TLM (FM) VIDEO	FM	11	245.3 Pre-D Comb.	Dir
12	TLM Data Modem No. 1	Dir	12		
13	TLM Data Modem No. 2	Dir	13		
14	TLM Mixer No. 2	Dir	14	TLM Mixer No. 2	Dir
T R K	MSFC DSS No. 632 Recorder No. 3 (VR-3600) (Note)	Mode	T R K	MCC DSS No. 633 Recorder No. 4 (M-22)	Mode
1	TLM Mixer No. 1	Dir	1	Patch redundant to, and operate	
2			2	simultaneously with recorder	
3			3	No. 1 through TLI.	
4	241.5 Pre-D LHC BF-1	Dir	4		
5	36-Bit BCD on 1 kHz	Dir	5		
6	2287.5 CSM TLM Video	FM	6		
7	248.6 Pre-D Comb. BP-1	Dir	7		
8	234.0 Pre-D LHC BF-2	Dir	8		
9	256.2 Pre-D LHC AF-1	Dir	9		
10	USB Mixer and Cycle Lock	Dir	10		
11	244.3 Pre-D Comb. LHC AP-1	Dir	11		
12			12		
13			13		
14	TLM Mixer No. 2	Dir	14		

Note

Recorder No. 3 is required only for the launch phase.

* LAUNCH THROUGH INSERTION PHASE ONLY.

Table 57-29. Telemetry Recorder Setup for MIL

T R K	MCC	DSS No. 630	Mode	T R K	MSFC	DSS No. 631	Mode
	Recorder No. 1 (M-22)				Recorder No. 2 (VR-3600)		
1	TLM Mixer No. 1		Dir	1	TLM Mixer No. 1		Dir
2	USB CMD Ver Rcvr No. 1		FM	2	USB CMD Ver Rcvr No. 1		FM
3	USB CMD Ver Rcvr No. 2		FM	3	USB CMD Ver Rcvr No. 2		FM
4	2287.5 TLM Video		FM	4			
5	36-Bit BCD on 1 kHz		Dir	5	36-Bit BCD on 1 kHz		Dir
6	TV Rcdr FM or Voice			6	258.5 Pre-D Comb. CP-1		Dir
6	2272.5 Rcdr Dir			7	2282.5 IU TLM Video DP-1B		FM
7	2232.5 LM TLM Video		FM	8	250.7 Pre-D DF-1		Dir
8	2272.5 TLM Demod Output		FM	9	USB TDP Data Modem		Dir
9	LM EKG		Dir	10	USB Mixer and Cycle Lock		Dir
10	USB Mixer and Cycle Lock		Dir	11	245.3 Pre-D Comb.		Dir
11	2272.5 MHz LM SØ Dump		FM	12			
12	TLM Data Modem No. 1		Dir	13			
13	TLM Data Modem No. 2		Dir	14	TLM Mixer No. 2		Dir
14	TLM Mixer No. 2		Dir				
T R K	MSFC	DSS No. 632	Mode	T R K	MCC	DSS No. 633	Mode
	Recorder No. 3 (VR-3600)	(Note)			Recorder No. 4 (M-22)		
1	TLM Mixer No. 1		Dir	1	Patch redundant to, and operate		
2				2	simultaneously with recorder		
3				3	No. 1 through TLI.		
4	241.5 Pre-D LHC BF-1		Dir	4			
5	36-Bit BCD on 1 kHz		Dir	5			
6	2287.5 CSM TLM Video		FM	6			
7	248.6 Pre-D Comb. BP-1		Dir	7			
8	234.0 Pre-D LHC BF-2		Dir	8			
9	256.2 Pre-D LHC AF-1		Dir	9			
10	USB Mixer and Cycle Lock		Dir	10			
11	244.3 Pre-D Comb. LHC AP-1		Dir	11			
12				12			
13				13			
14	TLM Mixer No. 2		Dir	14			

Note

Recorder No. 3 is required only for the launch phase.

Table 57-30. Telemetry Receiver Configuration for TAN

Link	Vehicle	Rcvr Type	Ant/Rcvr No.		Rcvr Front Panel Setting				Ships		AGC S/S Mixers			AGC S/S Strip Chart Rcdr	
			Config LHC	Linear RHC	Freq (MHz)	IF/Comb BW (kHz)	Video Fil BW (kHz)	Demod AGC Type	Mix 1 IRIG	Mix 2 IRIG	Mix 3 IRIG	Rcdr 1 Pen No.	Rcdr 2 Pen No.		
														0°	90°
DF-1	IU	1455	X		250.7	500	300			12			3		
DP-1	IU	1455	X		245.3	300	100			13			4		
CP-1	S-IVB	1455	X		258.5	300	100			14			5		

Table 57-31. Telemetry Recorder Setup for TAN

T R K	MSFC DSS No. 530 Recorder No. 1 (VR-3600)	Mode	T R K	MSFC DSS No. 531 Recorder No. 2 (FR-607)	Mode
1	TLM Mixer No. 1	Dir	1	TLM Mixer No. 1	Dir
2			2	36-Bit BCD on 1 kHz	Dir
3			3	258.5 Video RHC CP-1	Dir
4			4	250.7 Video RHC DF-1	Dir
5	36-Bit BCD on 1 kHz	Dir	5	245.3 Video RHC DP-1	Dir
6	258.5 Video RHC CP-1	FM	6		
7			7	TLM Mixer No. 2	Dir
8	250.7 Video RHC DF-1	Dir	8	Operate as backup and use direct	
9			9	record mode.	
10			10		
11	245.3 Video RHC DP-1	FM	11		
12			12		
13			13		
14	TLM Mixer No. 2	Dir	14		
T R K	Recorder No. 3	Mode	T R K	Recorder No. 4	Mode
1			1		
2			2		
3			3		
4			4		
5			5		
6			6		
7			7		
8			8		
9			9		
10			10		
11			11		
12			12		
13			13		
14			14		

Table 57-32. Telemetry Receiver Configuration for TEX

[illegible]

Table 57-33. Telemetry Recorder Setup for TEX

T R K	MCC DSS No. 630 Recorder No. 1 (M-22)	Mode	T R K	MSFC DSS No. 631 Recorder No. 2 (VR-3600)	Mode
1	TLM Mixer No. 1	Dir	1	TLM Mixer No. 1	Dir
2	USB CMD Ver Rcvr	FM	2	USB CMD Ver Rcvr No. 1	FM
3			3		
4	2287.5 TLM Video	FM	4		
5	36-Bit BCD on 1 kHz	Dir	5	36-Bit BCD on 1 kHz	Dir
6	TV Rcdr FM or Voice 2272.5 Rcdr Dir		6	258.5 Pre-D Comb. CP-1	Dir
7	2282.5 LM TLM Video	FM	7	2282.5 IU TLM Video DP-1B	FM
8	2272.5 TLM Demod Output	FM	8	250.7 Pre-D Comb. DF-1	Dir
9	LM EKG	Dir	9	USB TDP Data Modem	Dir
10	USB Mixer and Cycle Lock	Dir	10	USB Mixer and Cycle Lock	Dir
11	2272.5 MHz LM SØ Dump	FM	11	245.3 Pre-D Comb. DP-1	Dir
12	TLM Data Modem No. 2	Dir	12		
13	TLM Data Modem No. 2	Dir	13		
14	TLM Mixer No. 2	Dir	14	TLM Mixer No. 2	Dir
T R K	MCC DSS No. 632 Recorder No. 3 (M-22)	Mode	T R K	Recorder No. 4	Mode
1	Patch redundant to and operate		1		
2	simultaneously with recorder		2		
3	No. 1 through TLI.		3		
4			4		
5			5		
6			6		
7			7		
8			8		
9			9		
10			10		
11			11		
12			12		
13			13		
14			14		

Table 57-34. Telemetry Recorder Setup for GDS

T R K	Prime Station Data DSS No. 630 and 631 Recorder No. 1 and 2	Mode	T R K	
1	TLM Mixer No. 1	Dir		
2	CSM CMD Ver Rcvr	FM		
3	2287.5 TLM Video	FM		
4	2272.5 TLM Demod Output	FM		
5	36-Bit BCD on 1 kHz	Dir		
6	409.6 kHz from SS TV Conv	Dir		
7	2282.5 LM TLM Video or IU TLM Video	FM		
8	2272.5 TV or Voice Dump (Note 2 & 4)			
9	1.25 MHz EVC Composite (Note 3)	Dir		
10	USB Mixer No. 1 and Cycle Lock	Dir		
11	2272.5 MHz LM S ϕ Dump (Note 2)	FM		
12	TLM Data Modem No. 1	Dir		
13	TLM Data Modem No. 2	Dir		
14	TLM Mixer No. 2	Dir		
T R K	Wing Station Data DSS No. 632 and 633 Recorder No. 3 and 4	Mode	T R K	
1	TLM Mixer No. 1 (Note 1)	Dir	1	
2	LM CMD Ver Rcvr	FM	2	
3	2287.5 TLM Video	FM	3	
4	2272.5 TLM Demod Output	FM	4	
5	36-Bit BCD on 1 kHz	Dir	5	
6	409.6 kHz from SS TV Conv	Dir	6	
7	2282.5 LM TLM Video or IU TLM Video	FM	7	
8	(Note 2 2272.5 TV or Voice Dump & 4)		8	
9	1.25 MHz EVC Composite (Note 3)	Dir	9	
10	USB Mixer No. 1 and Cycle Lock	Dir	10	
11	2272.5 MHz LM S ϕ Dump (Note 2)	Dir	11	
12	2287.5 LM TLM Video (Note 1)	Dir	12	
13	LM Video (Note 1)	Dir	13	
14	TLM Mixer No. 2	Dir	14	

Notes

1. From 210-foot antenna only
2. Stations will ensure that dump data is recorded on two recorders. If the SCM does not configure both prime and wing stations for dump, use discretion as to the source of data. Annotate any change from nominal data source on the tape label.
3. See para 57.1.3.8 for description.
4. Voice dump recorded direct and TV recorded FM.

Table 57- 35 . Telemetry Recorder Setup for HSK

AMENDED BY PDC Nr 24 & 10

T R K	PRIME STATION DATA (M-22) DSS NO. 630 & 631 RECORDER NO. 1 & 2	Mode	T R K	RECORDER NO. 2	Mode
1	TLM MIXER No. 1	DIR	1		
2	CSM CMD VER RCVR	FM	2	MIXER 1 SETUP (PDC Nr 10)	
3	2287.5 TLM VIDEO	FM	3	IRIG 18 - VOICE ANNO (PRIME)	
4	2272.5 TLM DEMOD OUTPUT (NOTE 2)	FM	4	IRIG 17 - M & O LOOP	
5	36 - BIT BCD ON 1 KHz	DIR	5	IRIG 16 - VOICE ANNO (WING)	
6	BASE BAND EVC COMP. (NOTE 3)	DIR	6	100KHz REF	
7	2282.5 IM TLM VIDEO OR IU TLM VIDEO	FM	7	BIOMED MIXER (IRIG 1 THRU 7)	
8	2272.5 DUMP VOICE (NOTE 2)	DIR	8		
9	1.25 MHz EVC COMPOSITE (NOTE 3)	DIR	9	MIXER 2 SETUP (PDC Nr 10)	
10	USB MIXER No. 1 AND CYCLE LOCK	DIR	10	IRIG 18-36 BIT BCD/1KHz	
11	2272.5 MHz IM S PHASE DUMP (NOTE 2)	FM	11	IRIG 17 - NET 1	
12	TLM DATA MODEM No. 1	DIR	12	IRIG 16 - SDT/1KHz	
13	TLM DATA MODEM No. 2	DIR	13	USB MIXER 2 (IRIG 3 THRU 8)	
14	TLM MIXER No. 2	DIR	14		
T R K	WING STATION DATA (M-22) RECORDER DSS No. 632 AND 633 RECORDER NO. 3 & 4	Mode	NOTES 1. From 210 - Foot antenna <u>at all times</u> <u>it is actually supporting and from</u> <u>the wing 85ft Ant. at all other times.</u> (PDC 2) 2. Stations will assure that Dump data is recorded on two recorders. If the SQM does not configure both the prime and wings stations for dump, use discretion regarding the data source. Annotate any change from the nominal data source on tape label. 3. See Para 57.1.3.8 for description.		
1	TLM MIXER No. 1	DIR			
2	IM CMD VER RCVR	FM			
3	2287.5 TLM VIDEO	FM			
4	2272.5 TLM DEMOD OUTPUT (NOTE 2)	FM			
5	36 BIT BCD ON 1 KHz	DIR			
6	409.6 KHz FROM SS TV CONV	DIR			
7	2282.5 IM TLM VIDEO OR IU TLM VIDEO	FM			
8	2282.5 IM TV	FM			
9	1.25 MHz EVC COMPOSITE (NOTE 1 & 3)	DIR			
10	USB MIXER No. 1 AND CYCLE LOCK	DIR			
11	2272.5 MHz IM S PHASE DUMP (NOTE 2)	FM			
12	2282.5 IM TLM VIDEO (NOTE 1)	FM			
13	2272.5 DUMP VOICE (NOTE 2)	DIR			
14	TLM MIXER No. 2	DIR			

Table 57-36. Telemetry Recorder Setup for MAD

T R K	Prime Station Data DSS No. 630 and 631 Recorder No. 1 and 2(M-22)	Mode	T R K		
1	TLM Mixer No. 1	Dir	1		
2	C3M CMD Ver Rcvr	FM	2	<u>Mixer 1 Setup</u>	
3	2287.5 TLM Video	FM	3	IRIG 18 - Voice Annotation	
4	2272.5 TLM Demod Output	FM	4	IRIG 17 - M&O Loop	
5	36-Bit BCD on 1 kHz	Dir	5	100-KC Ref.	
6	409.6 kHz from SS TV Conv	Dir	6	Biomed Mixer (IRIG 1 thru 7)	
7	2282.5 LM TLM Video or IU TLM Video	FM	7	<u>Mixer 2 Setup</u>	
8	2272.5 TV or Voice Dump (Note 3)	FM	8	IRIG 18 - SDT	
9	1.25 MHz EVC Composite (Note 2)	Dir	9	IRIG 17 - NET 1	
10	USB Mixer No. 1 and Cycle Lock	Dir	10	USB Mixer 2 (IRIG 3 thru 8)	
11	2272.5 MHz LM SØ Dump	FM	11		
12	TLM Data Modem No. 1	Dir	12		
13	TLM Data Modem No. 2	Dir	13		
14	TLM Mixer No. 2	Dir	14		
T R K	Wing Station Data (M-22) Recorder No. 3 and 4 DSS No. 632 and 633	Mode	T R K		
1	TLM Mixer No. 1 (Note 1)	Dir	1		
2	LM CMD Ver Rcvr No. 2 or 4	FM	2		
3	2287.5 TLM Video	FM	3		
4	2272.5 TLM Demod Output	FM	4		
5	36 Bit BCD on 1 kHz	Dir	5		
6	409.6 kHz from SS TV Conv	Dir	6		
7	2282.5 LM TLM Video or IU TLM Video	FM	7		
8	2272.5 TV or Voice Dump (Note 3)	FM	8		
9	1.25 MHz EVC Composite (Note 2)	Dir	9		
10	USB Mixer No. 1 and Cycle Lock	Dir	10		
11	2272.5 MHz LM SØ Dump	Dir	11		
12			12		
13			13		
14	TLM Mixer No. 2	Dir	14		

Note

1. Stations will ensure that dump data is recorded on two recorders. If the SCM does not configure both the prime and wing stations for dump, use discretion regarding the data source. Annotate any change from the nominal data source on the tape label.
2. See para 57.1.3.8 for description.
3. Voice dump recorded direct and TV recorded pm.

Table 57-37. Telemetry Receiver Configuration for HTV

[illegible]

Table 57-38. Telemetry Recorder Setup for HTV

T R K	MCC DSS No. 630 Recorder No.1 (M-22)	Mode	T R K	MSFC DSS No. 631 Recorder No.2 (M-22)	Mode
1	TLM Mixer No. 1	Dir	1	TLM Mixer No. 1	Dir
2			2		
3			3		
4	2287.5 TLM Video (Note 1)	FM	4		
5	36-Bit BCD on 1 kHz	Dir	5	36-Bit BCD on 1 kHz	Dir
6	2272.5 Voice Dump (Note 1)	Dir	6	258.5 Comb. Video CP-1	FM
7	2282.5 LM TLM Video (Note 1)	FM	7	2282.5 IU TLM Video DP-1B(Note 1)	FM
8	2272.5 TLM Video (Note 1)	FM	8	250.7 Video RHC DF-1	Dir
9	LM EKG (Note 1)	Dir	9		
10	USB Mixer and Cycle Lock	Dir	10	USB Mixer and Cycle Lock	Dir
11			11	245.3 Comb. Video DP-1	FM
12			12	250.7 Video RHC DF-1	Dir
13			13		
14	TLM Mixer No. 2	Dir	14	TLM Mixer No. 2	Dir
T R K	Recorder No.3	Mode	T R K	Recorder No.4	Mode
1			1		
2			2		
3			3		
4			4		
5			5		
6			6		
7			7		
8			8		
9			9		
10			10		
11			11		
12			12		
13			13		
14			14		

Note

Since HTV has just one SDDS output, only one USB downlink can be recorded at any particular time. This signal will be recorded in accordance with the above assignments.

Table 57-40. Telemetry Recorder Setup for MER

T R K	MCC DSS No. 630 Recorder No.1 (M-22)	Mode	T R K	MSFC DSS No. 631 Recorder No.2 (M-22)	Mode
1	TLM Mixer No. 1	Dir	1	TLM Mixer No. 1	Dir
2	USB CMD Ver Rcvr No. 1	FM	2	USB CMD Ver Rcvr No. 1	FM
3	USB CMD Ver Rcvr No. 2	FM	3	USB CMD Ver Rcvr No. 2	FM
4	2287.5 TLM Video	FM	4		
5	36-Bit BCD on 1 kHz	Dir	5	36-Bit BCD on 1 kHz	Dir
6	2272.5 Voice Dump (Note)	Dir	6	258.5 Comb. Video CP-1	FM
7	2282.5 LM TLM Video	FM	7	2282.5 IU TLM Video DP-1B	FM
8	2272.5 TLM Demod Output	FM	8	250.7 Pre-D RHC DF-1	Dir
9	LM EKG	Dir	9	CDP Data Modem	Dir
10	USB Mixer and Cycle Lock	Dir	10	USB Mixer and Cycle Lock	Dir
11	2272.5 MHz LM SØ Dump	FM	11	245.3 Comb. Video DP-1	FM
12	TLM Data Modem No. 1	Dir	12	250.7 Pre-D LHC DF-1	Dir
13	TLM Data Modem No. 2	Dir	13	2287.5 TLM Video	FM
14	TLM Mixer No. 2	Dir	14	TLM Mixer No. 2	Dir
T R K	Recorder No.3	Mode	T R K	Recorder No.4	Mode
1			1		
2			2		
3			3		
4			4		
5			5		
6			6		
7			7		
8			8		
9			9		
10			10		
11			11		
12			12		
13			13		
14			14		

Note

TV not required on Class-19 ships

Table 57-41. Telemetry Receiver Configuration For RED

Link	Vehicle	Rcvr Type	Ant/Rcvr No.		Rcvr Front Panel Setting				Ships		AGC S/S Mixers			AGC S/S Chart Rcdr		Strip Rcdr
			Config	Linear	Freq (MHz)	IF/Comb BW (kHz)	Video Fil BW (kHz)	AGC	Type	Mix 1 IRIG	Mix 2 IRIG	Mix 3 IRIG	Rcdr 1 Pen No.	Rcdr 2 Pen No.		
															LHC	
DF-1	IU	TR-102	X	X	250.7	500	250	100	C	12A	12B	3	4			
DP-1	IU	TR-102	X	X	245.3	300	100	100	B	13A	13B	5	6			
CP-1	S-IVB	TR-102	X	X	258.5	300	100	100	B	14A	14B	7	8			
Note 1) EM	CSM	TR-102	X	X	243.0	10	6.25	1	A	11				1		
VHF	CSM	A/G			296.8/ 259.7									1		
VHF	CSM	A/G			296.8/ 259.7									2		

<div>1</div>	Voice annotation on IRIG 18, M&O loop on IRIG 17, 100-kHz ref. and biomed mixer output.
<div>2</div>	36-Bit BCD/1 kHz on IRIG 18, Net 1 on IRIG 17, and SDT/1 kHz on IRIG 16

Legend

Notes

1. EM-emergency hand held transmitter (VAN only)

2. See paragraph 57.3.3 for stripchart operations

Table 57-42. Telemetry Recorder Setup for RED

T R K	MCC DSS No. 630 Recorder No.1 (M-22)	Mode	T R K	MSFC DSS No. 631 Recorder No.2 (M-22)	Mode
1	TLM Mixer No. 1	Dir	1	TLM Mixer No. 1	Dir
2	USB CMD Ver Rcvr No. 1	FM	2	USB CMD Ver Rcvr No. 1	FM
3	USB CMD Ver Rcvr No. 2	FM	3	USB CMD Ver Rcvr No. 2	FM
4	2287.5 TLM Video	FM	4		
5	36-Bit BCD on 1 kHz	Dir	5	36-Bit BCD on 1 kHz	Dir
6	2272.5 Voice Dump (Note)	Dir	6	258.5 Comb. Video CP-1	FM
7	2282.5 LM TLM Video	FM	7	2282.5 IU TLM Video DP-1B	FM
8	2272.5 TLM Demod Output	FM	8	250.7 Pre-D RHC DF-1	Dir
9	LM EKG	Dir	9	CDP Data Modem	Dir
10	USB Mixer and Cycle Lock	Dir	10	USB Mixer and Cycle Lock	Dir
11	2272.5 MHz LM S \emptyset Dump	FM	11	245.3 Comb. Video DP-1	FM
12	TLM Data Modem No. 1	Dir	12	250.7 Pre-D LHC DF-1	Dir
13	TLM Data Modem No. 2	Dir	13	2287.5 TLM Video	FM
14	TLM Mixer No. 2	Dir	14	TLM Mixer No. 2	Dir
T R K	Recorder No. 3	Mode	T R K	Recorder No. 4	Mode
1			1		
2			2		
3			3		
4			4		
5			5		
6			6		
7			7		
8			8		
9			9		
10			10		
11			11		
12			12		
13			13		
14			14		

Note

TV not required on Class-19 ships

Table 57-43. Telemetry Receiver Configuration For VAN

Link	Vehicle	Rcvr Type	Ant/Rcvr No.		Rcvr Front Panel Setting				Ships		AGC S/S Mixers			AGC S/S Strip Chart Rcdr	
			LHC Config	Linear	Freq (MHz)	IF/Comb BW (kHz)	Video Fil BW (kHz)	AGC Type	Demod Type	Mix 1 IRIG	Mix 2 IRIG	Mix 3 IRIG	Rcdr 1 Pen No.	Rcdr 2 Pen No.	
															RHC
DF-1	IU	TR-102	X	X	250.7	500	250	100	C	12A	12B	3	4		
DP-1	IU	TR-102	X	X	245.3	300	100	100	B	13A	13B	5	6		
CP-1	S-IVB	TR-102	X	X	258.5	300	100	100	B	14A	14B	7	8		
(Note 1) EM	CSM	TR-102	X	X	243.0	10	6.25	1	A	11		1			
									</						

Table 57-44, Telemetry Recorder Setup for VAN

T R K	MCC DSS No. 630		T R K	MSFC DSS No. 631	
	Recorder No. 1 (M-22)	Mode		Recorder No. 2	Mode
1	TLM Mixer No. 1	Dir	1	TLM Mixer No. 1	Dir
2	USB CMD Ver Rcvr No. 1	FM	2	USB CMD Ver Rcvr No. 1	FM
3	USB CMD Ver Rcvr No. 2	FM	3	USB CMD Ver Rcvr No. 2	FM
4	2287.5 TLM Video	FM	4		
5	36-Bit BCD on 1 kHz	Dir	5	36-Bit BCD on 1 kHz	Dir
6	2272.5 Voice Dump (Note)	Dir	6	258.5 Comb. Video CP-1	FM
7	2282.5 LM TLM Video	FM	7	2282.5 IU TLM Video DP-1B	FM
8	2272.5 TLM Demod Output	FM	8	250.7 Pre-D RHC DF-1	Dir
9	LM EKG	Dir	9	CDP Data Modem	Dir
10	USB Mixer and Cycle Lock	Dir	10	USB Mixer and Cycle Lock	Dir
11	2272.5 MHz LM SØ Dump	FM	11	245.3 Comb. Video DP-1	FM
12	TLM Data Modem No. 1	Dir	12	250.7 Pre-D LHC DF-1	Dir
13	TLM Data Modem No. 2	Dir	13	243.0 CSM Voice	Dir
14	TLM Mixer No. 2	Dir	14	TLM Mixer No. 2	Dir
T R K	Recorder No. 3		T R K	Recorder No. 4	
		Mode			Mode
1			1		
2			2		
3			3		
4			4		
5			5		
6			6		
7			7		
8			8		
9			9		
10			10		
11			11		
12			12		
13			13		
14			14		

Note

TV not required on Class-19 ships

Table 57-45. Station Spacecraft Communication Recorders

T R K	GDS HSK MAD DSS No. 330 FR1100/GS-80	Mode	T R K	30 foot USB Stations (Land & Ships) FR1100/GS80 & AMP-300 DSS No. 330	Mode
1	Voice Annotation/Sta Conf. loop		1	Voice Annotation	
2	Net 1		2	Net 1	
3	Net 2		3	Net 2	
4	Net 3		4	Net 3	
5	LM AM Key		5	VHF A/G Loop	
6	USB CSM A/G loop		6	USB CSM A/G Loop	
7	USB LM A/G loop		7	USB LM A/G Loop	
8	USB Voice Ver Rcvr No. 1		8	USB Voice Ver RCVR No. 1	
9	36 bit BCD on 1 KHZ		9	36-Bit BCD on 1 KHZ	
10	USB Voice Ver Rcvr No. 2		10	USB Voice Ver Rcvr No. 2	
11	USB CSM Backup Voice		11	USB CSM backup Voice	
12	USB LM Backup Voice		12	(Note 1) Radar Handover (BDA) USB LM Backup Voice	
13	M&O Loop		13	M&O Loop	
14	CSM AM Key		14	Station Conference Loop	
T R K	C100 (CAL) DSS No. 330	Mode	T R K		Mode
1	Voice Annotation		1		
2			2		
3	VHF A/G Loop		3		
4	VHF A/G SS Mixer (Note 2)		4		
5	IRIG C 1 kHz		5		
6	IRIG B 1 kHz		6		
7			7		
8			8		
9			9		
10			10		
11			11		
12			12		
13			13		
14			14		

Notes

1. If a contingency occurs, the LM backup voice will be recorded on track 1 (BDA only).
2. Use IRIGs 9 and 10 for VHF voice AGC.

Table 57-45. Station and Spacecraft Communications Recorders (cont)

T R K	GR-2500 (HTV) DSS No. 330	Mode	T R K		Mode
1	Voice annotation		1		
2	VHF A/G Loop		2		
3	USB CSM A/G Rcvr Output		3		
4	M&O Loop		4		
5	Net 1		5		
6	USB Voice Ver Rcvr		6		
7	Timing (WWV or WWVH) (Note 3)		7		
8			8		
9			9		
10			10		
11			11		
12			12		
13			13		
14			14		
T R K	FR-607 (TAN) DSS No. 330	Mode	T R K		Mode
1	Voice annotation		1		
2	VHF A/G Loop		2		
3			3		
4	M&O Loop		4		
5	Net 1		5		
6			6		
7	SDT 1 kHz		7		
8			8		
9			9		
10			10		
11			11		
12			12		
13			13		
14			14		

Notes (cont)

3. HTV may record JJY/vice WWVH if TSP renders WWVH unusable.

Table 57-46. Validation Tape Track Assignments

T R K	Confidence Tape	Mode	T R K	CADFISS	Mode
1	Open		1	Open	
2	CSM HLBR (51.2 kbps)	FM	2	ALSEP 2, Normal	FM
3	CSM LBR (1.6 kbps)	FM	3	SIC	FM
4	LM/CSM EMOD (51.2 kbps)	FM	4	CSM LBR	FM
5	CSM HBR (51.2 kbps)	FM	5	CSM HLBR	FM
6	CSM/CMC Events	FM	6	CSM HBR 51.2 (Biomed)	FM
7	S-IVB	FM	7	S-IVB	FM
8	LM HBR	FM	8	IU	FM
9	IU	FM	9	LM HBR	FM
10	LM LBR (1.6 kbps)	FM	10	LM HLBR	FM
11	S-II (72.0 kbps)	FM	11	LM LBR	FM
12	LM MLBR (12.8 kbps) and LM HLBR (51.2 kbps)	FM	12	LM MLBR	FM
13	SIC	FM	13	S-II	FM
14	Open		14	ALSEP 2, cont	FM
T R K	Recorder No. 3	Mode	T R K	Recorder No. 4	Mode
1			1		
2			2		
3			3		
4			4		
5			5		
6			6		
7			7		
8			8		
9			9		
10			10		
11			11		
12			12		
13			13		
14			14		

Supplement to Section 58

Displays

SUPPLEMENT TO SECTION 58. DISPLAYS

58.1 GENERAL

This supplement contains the information necessary for configuring the MIL abort interface console recorder, MK200 recorder, station operator consoles, and the BDA range safety console.

Note

To assist in filling out PLIM's, all stations may, at their option, record decom sync status on available recorders.

58.2 MIL STATION CONFIGURATION

Table 58-1 contains MK 200 setup and table 58-2 contains information for configuring the abort interface console.

58.3 BDA RANGE SAFETY SUPPORT

The S-II, S-IVB, and IU data as given in table 58-3 will be displayed on event lights, pen recorders, and display meters at the range safety officer's console. DAC and stores listed on table 58-3 are in the MSFTP-2 decom programs.

58.4 STATION OPERATORS CONSOLE CONFIGURATION

58.4.1 Station operators console will have the following display labels:

PCM-1 SOLID	PCM-2 SOLID	PCM-3 SOLID	PCM-4 SOLID
CSM-HBR	CSM-HBR	CSM-HBR	CSM-HBR
CSM-LBR	CSM-LBR	CSM-LBR	CSM-LBR
S-IVB	S-IVB	S-IVB	S-IVB
IU	IU	IU	IU
LM-HBR	LM-HBR	LM-HBR	LM-HBR
LM-LBR	LM-LBR	LM-LBR	LM-LBR
S-II	S-II	S-II	S-II
CSM-HLBRD	CSM-HLBRD	CSM-HLBRD	CSM-HLBRD
LM-MLBRD	LM-MLBRD	LM-MLBRD	LM-MLBRD
LM-HLBRD	LM-HLBRD	LM-HLBRD	LM-HLBRD

58.4.2 Station operators console patching instructions follow:

<u>Format</u>	<u>Assignment TB 1, 2, 3 & 4</u>		<u>Console Light No.</u>	<u>Bit Configuration of Format ID</u>
CSM-HBR	3B	to	1	00110 (6_{10})
CSM-LBR	1C	to	2	00111 (7_{10})
S-IVB	2C	to	3	01000 (8_{10})
IU	3C	to	4	01001 (9_{10})
LM-HBR	1D	to	5	01010 (10_{10})
CSM-HBRD	1I or 1J*			11001 (25_{10})
LM-LBR	2D	to	6	01011 (10_{11})
CSM-LBRD	1E			01101 (13_{10})
S-II	3E	to	7	01111 (15_{10})
CSM-HLBRD	3I or 3J*	to	8	11011 (27_{10})
LM-MLBRD	3A	to	9	00011 (3_{10})
LM-HLBRD	2B	to	10	00101 (5_{10})

* Patch to J only if TB-1 is not designated with the letter I.

Table 58-1. MIL Analog Recorder (MK 200)
DSS No. 554

<u>Pen (Analog)</u>	<u>Measurement No.</u>
1	Decom No 1 Sync
2	Decom No 2 Sync
3	Decom No 3 Sync
4	Decom No 4 Sync
5	Spare
6	Spare
7	Spare
8	Spare

Table 58-2. MIL Abort Interface Unit (AIU) Recorder (MK 200)
DSS No. 256

Analog Pen No.	Measurement	
1	B-3 } B-2 } B-1 }	2 out of 3 logic for Abort B command
2		
3		
4	A-1 } A-2 } A-3 }	2 out of 3 logic for Abort A command
5		
6		
7	B verified	
8	A verified	

Event Pen No.	Measurement
1	SDT
2	CSM/SM Sep A (CD0023X)
3	CSM/SM Sep B (CD0024X)
4	Abort A
5	Abort B
6	Interrupt status
7	Test/Operate
8	Spare
9	SDT

Table 58-3. BDA Range Safety Requirements

Freq (MHz)	Link	Meas. No.	IRIG	DAC	Store	Display Requirement							Display Label	
						San 8 Ch	RSO		ESE		MK 200			
							Mtr	Evt	Mtr	Evt	8 Ch	Evt		
245.3	DP-1	R4-602		56		3	7				1		S-IVB PITCH	
245.3	DP-1	R5-602		57		4	8				2		S-IVB YAW	
245.3	DP-1	R6-602		58		5	9				3		S-IVB ROLL	
234.0	BF-2	D13-201	12				1				4		E1 THRUST CHAMBER PRESSURE	
234.0	BF-2	D13-202	13				2				5		E2 THRUST CHAMBER PRESSURE	
234.0	BF-2	D13-203	11				3				6		E3 THRUST CHAMBER PRESSURE	
234.0	BF-2	D13-204	10				4				7		E4 THRUST CHAMBER PRESSURE	
241.5	BF-1	D13-205	11				5				8		E5 THRUST CHAMBER PRESSURE	
248.6	BP-1	M55-221		53		1	6						RCVR 1 SIG STR HI	
248.6	BP-1	M56-221		52		2							RCVR 2 SIG STR LO	
248.6	BP-1	K231-203			114			9					E3 MAINSTAGE OK PRESS A	
248.6	BP-1	K285-203			115			10					E3 MAINSTAGE OK DEPRESS A	
258.5	CP-1	D1-401		59		6	10						PRESS - THRUST CHAMB	
258.5	CP-1	K14-401			41			16			1		MAINSTAGE OK PRESS SW1	
258.5	CP-1	K157-401			117			20			2		MAINSTAGE OK PRESS SW2	
258.5	CP-1	K158-401			118			17			3		MAINSTAGE OK PRESS SW1 DEPRESS	
258.5	CP-1	K159-401			119			21			4		MAINSTAGE OK PRESS SW2 DEPRESS	
258.5	CP-1	N57-411		55		7	11						R/S RCVR 1 SIG STR	
258.5	CP-1	N62-411		54		8	12						R/S RCVR 2 SIG STR	
245.3	DP-1	K75-602			112						6		EDS OR MANUAL CUTOFF	
248.6	BP-1	K421-207			113						5		EDS ALL ENGS CUTOFF	

Supplements to Section 60

SPAN

Supplement to Section 61

ARIA

SUPPLEMENT TO SECTION 61. APOLLO RANGE

INSTRUMENTATION AIRCRAFT (ARIA)

61.1 OPERATIONS

61.1.1 GENERAL

61.1.1.1 Eight ARIA will support the AS-506 Mission in the Indian Ocean/Australian/Pacific sector. Operational control of ARIA will be exercised through the Air Operations Control Center (AOCC) at Patrick AFB and the worldwide ARIA communications network.

61.1.1.2 The mission plan calls for ARIA to support the Translunar Injection (TLI) events on revolution 2 or 3 and from exit blackout to recovery of the spacecraft crew after splashdown.

61.1.2 MISSION SUPPORT PLAN

61.1.2.1 Support Priority. First priority for ARIA support is assigned to the TLI events, end of blackout to splash, and voice relay after splashdown.

61.1.2.2 Support Operations

a. F-0 Operations

(1) The ARIA will depart from the assigned staging bases in the Indian Ocean/Australian/Pacific sector to support the TLI event.

(2) ARIA number, launch azimuth coverage, and staging and recovery bases (first and second opportunity) will be provided by PDC or ISI as table 61-1

(3) ARIA coverage of TLI events is required to augment ship and land station coverages. Requirements for ARIA coverage of TLI events are:

(a) Preignition sequence from event T6 (preignition sequence initiate) minus 30 seconds to T7 (TLI cutoff) plus 60 seconds.

(b) S-IVB ignition minus 90 seconds to plus 30 seconds.

(c) S-IVB cutoff minus 60 seconds to plus 60 seconds.

(4) To accomplish required mission support, the eight ARIA assigned will be deployed to multiple staging bases in the Indian Ocean/Australian/Pacific sector and will be prepared to react to any combination of launch day, launch azimuth, and injection opportunity. Premission flight planning, selection of staging and recovery bases, TSP selection, etc., have been accomplished by computer to optimize coverage for all day and azimuth combinations.

(5) When possible, ARIA will be assigned to staging bases selected to allow for a plus-time take off, thus ensuring that aircraft are not committed to flight before launch. After launch, computer updated TSP and acquisition information will be provided to the AOCC and sent to the support aircraft, as required.

b. Reentry Operations. Four ARIA will support emergence from blackout (reentry) to splashdown and relay spacecraft crew voice to MCC until crew recovery. Support details will be provided by PDC or ISI as table 61-2.

61.1.2.3 ARIA Coverage Summary. Those portions of the data intervals described in paragraph 61.1.2.2a (3) (a) through (c) which are not covered by ship and land stations are assigned to ARIA. Coverage of these intervals is as follows:

<u>Launch Day</u>	<u>Coverage</u>
1	All azimuths, 2nd and 3rd rev TLI
2	All azimuths, 2nd and 3rd rev TLI
3	All azimuths, 2nd and 3rd rev TLI
4	All azimuths, 2nd and 3rd rev TLI
5	All azimuths, 2nd and 3rd rev TLI

61.1.2.4 Data Transfer. ARIA will be used for data transfers to MSFN stations as required.

Note

All data transfers will be accomplished at the same tape speed as the data record speed. Ground stations must be advised that the data is on 900 kHz for 120-ips recorder speed, or on 450 kHz for 60-ips recorder speed.

61.1.2.5 Ship/ARIA Data Transfer

a. General. Apollo ships will transmit data, previously received and recorded, to the ARIA S-band receiving system. The aircraft will approach the ship on a straight-in radial pattern, accomplish the transfer, return to the starting location, and repeat for each data run. Three data runs will be necessary to transfer all required data. The aircraft will record the data on tape and deliver it to the user in the shortest possible time.

b. Operating Procedures

(1) At completion of TLI and after releasing ships from assigned TSP, the ships course and speed will be forwarded to AOCC from the NST. The AOCC will forward the estimated time of arrival of the aircraft at the ship to NST for relay to the ship. Depending on the location and heading of the ship, the aircraft will make a radial approach on an azimuth which will be determined during prepass coordination. Data run should start at approximately 85 percent of radio line of sight distance based on the following:

<u>Altitude (ft)</u>	<u>Max. Range (nmi)</u>
35,000	185
30,000	175
25,000	165

<u>Altitude (ft)</u>	<u>Max. Range (nmi)</u>
20,000	145
15,000	125
10,000	105
5,000	75

(2) Although these are line of sight distances, they should only be used as a reference. The actual data run should start only when the aircraft is receiving solid data based on the judgment of the operating personnel. The initial run will be primarily for setting levels and determining equipment configurations. If sufficient time remains after the setup, a data transfer may be accomplished; if not, the aircraft must return to the starting point and begin a new run. Prior to each run, the MC must coordinate with the M&O the details of the recording to be transferred for entry on the tape label. This should include links to be recorded, mode of recording, time (GMT) data was originally recorded, rev number of recorded data, geographic location of ship at time of original recording, and ship letter designator (RED or MER). After the initial setup period, the MC will notify the ship and allow time for them to rewind their tape. When both parties are ready, the MC will begin tape-start countdown. The M&O will notify the MC when the run is complete. A new run will be started as soon as possible.

c. Typical Sequence of Events. Data transfer sequence of events are as follows:

- | | |
|---------------------|---|
| (1) M&O/MC | HF contact established at about 500 miles |
| (2) MC to M&O | VHF carriers on for acquisition source (245.3 primary and 237.8 secondary) |
| (3) MC to Recorders | Confirm recorders loaded |
| (4) MC/M&O | Establish VHF communication and complete all coordination not completed at sequence (1) |
| (5) MC/M&O | Request carrier and modulation for level adjustment |
| (6) MC/M&O | Confirm good data; rewind for start of run |
| (7) MC/NAV | Confirm adequate time for data run |
| (8) MC/M&O | Start data on my Mark (5, 4, 3, 2, 1 Mark) |
| (9) M&O/MC | Run complete. |

d. Voice Communications

- (1) VHF. The VHF voice communications frequency between the ARIA and ship will be either 296.8 MHz (primary frequency) or 259.7 MHz (secondary frequency).

(2) HF. The HF voice communications frequency between the ARIA and ship will be coordinated by the NST prior to ARIA takeoff and will be, in order of preference, one of the following:

MER: 1. 4747 kHz
2. 5688 kHz
3. 5703 kHz

RED: 1. 9022 kHz
2. 6732 kHz

e. Aircraft Instrumentation

(1) General. The ship will be transmitting the following data on a 2282.5-MHz PM signal:

- (a) Binary coded timing on a 1-kHz phase modulated 1.25-MHz subcarrier
- (b) 72-kbps PCM phase modulated on a 1.024-MHz subcarrier
- (c) FM/FM data on a 450-kHz PM subcarrier.

(2) Receiver Setup

IF bandwidth: 3.3 MHz

Phase demodulator: 0 db

Video output: 0 db

(3) Tape Recorder Setup. The ARIA tape recorder setup for the ship/ARIA data transfer is depicted in table 61-3. Tape recorder speed will be 60 ips.

f. Reports. At completion of the transfer, a brief report will be made to the AOCC. This should include any problems encountered and an estimate of data quality. If any of the links are not transferred, the AOCC should be informed and an explanation given.

61.1.2.6 Test Support Positions

a. Test support position (TSP) locations, and movement of aircraft from TSP to TSP, provide optimum coverage for the TLI event as it may occur on the second or third revolution between 72° and 108° flight azimuths. TSPs are shown in "ARIA Almanacs" published at about F-15 days and updated as necessary by TTY.

b. TSPs for the AS-506 Mission are based upon the following conditions:

(1) TSP A, Preignition Sequence. TSP PCA time is S-IVB ignition minus 517 seconds at 100 nmi cross range.

(2) TSP B, S-IVB Ignition Sequence. TSP PCA time is S-IVB ignition plus 10 seconds at 100-nmi cross range.

(3) TSP C, S-IVB Ignition Cutoff Sequence. TSP PCA time is S-IVB ignition plus 227 seconds at 150 nmi cross range.

Table 61-3. Ship/ARIA Data Transfer Recorder Setup

Track	Data	Mode
1	100-kHz reference	Direct
2	Tracking RX link 2282.5 LCP post-D output	Direct
3	SDD 1.024 TLM output PCM LCP	FM
4	MUX (Note 1)	Direct
5	SDD 1.024 TLM output PCM RCP	FM
6	Tracking RX link 2282.5 RCP, post-D output	Direct
7	SDD 1.25 voice output (timing) LCP (Note 1)	FM
8	SDD 1.25 voice output (timing) RCP (Note 2)	FM
9	(Open)	
10	(Open)	
11	(Open)	
12	(Open)	
13	(Open)	
14	100-kHz reference	Direct

Notes

1. The MUX will contain RCP signal strength on 14.5 kHz, LCP signal strength on 22 kHz, and voice annotation on 40 kHz.
2. Timing outputs should be patched to the recorder from patches on the audio patch panel, labeled SDD-1 and SDD-2 in recorder area.

61.1.2.7 Test Support Position Identification

- a. The following is an example of ARIA test support position identification:

TSP 1.002.AL.072.U

- b. In this example:

- (1) The first digit refers to the ARIA No. (1 through 8).
- (2) The three-digit group refers to the S/C revolution number. For reentry coverage, this group will be 999.
- (3) The two-letter group which then follows identifies the TSP area. The first letter identifies the data coverage interval as follows:

A - Preignition sequence

B - S-IVB TLI ignition sequence

C - S-IVB TLI cutoff sequence

The second letter will be either "L" or "R" to indicate that the TSP is either to the left or right of the ground track as viewed in the direction of S/C travel.

- (4) The next three-digit group reflects the flight AZ to the nearest full degree below. For example, 72.62° will be expressed as 072° .

- (5) The last letter identifies the acquisition messages updated. U is the first update, V the second, etc.

61.2 ARIA DEPLOYMENT SCHEDULE

61.2.1 At about F-14 days, ARIA will enter mission sterilization. During the sterilization phase, the aircraft will be configured for the AS-506 Mission.

61.2.2 On about F-7/6 days, ARIA will leave Patrick AFB enroute to the Indian Ocean/Australian/Pacific sector. Detailed aircraft movement during deployment, mission support, and return-to-base phases will be reported according to Section 32 of the NOD.

61.2.3 Among the Indian Ocean/Australian/Pacific sector staging bases which may be employed are Mauritius, Cocos, Perth, Guam, Wake, Pago Pago, Nandi, and Hickam. Additional bases will be provided as necessary.

61.3 POINTING DATA

61.3.1 NOMINAL DATA

Nominal pointing data for ARIA for each TSP is provided in the "Instrumentation Almanac" published by AFETR (see Section 61.6 of the NOD).

Note

Prepermission almanacs are computed in 3-degree increments. If required, real-time updates will accommodate the actual launch azimuth.

61.3.2 UPDATED ACQUISITION DATA

The Aircraft Operations Control Center Information system will generate an updated almanac for each ARIA.

Almanac updating messages will be transmitted to the AOCC no later than H-45 minutes of each ARIA pass via a dedicated TTY circuit. The AOCC will relay messages to ARIA and HNET as necessary before H-24 minutes via TTY or voice.

61.4 INSTRUMENTATION CONFIGURATION

61.4.1 USB-CSM/IU

Refer to Section 54 of the NOD for USB transponder characteristics.

61.4.2 TELEMETRY LINKS

Refer to Section 57 of the NOD and these Supplements for telemetry link characteristics.

61.4.3 ARIA TELEMETRY LINK PRIORITIES

For ARIA supporting the TLI event, link priorities are:

1. 2287.5 MHz
245.3 MHz
258.5 MHz
2. 246.3 MHz
253.8 MHz
250.7 MHz
2282.5 MHz

61.4.4 RECORDERS

Predetected and postdetected receiver outputs and multiplexers will be patched to wideband recorders according to tables 61-4 through 61-8. Recorders will be calibrated as detailed in the "Prepermission Calibration Manual", TU-28319-1-2/RCDR. During the data recording interval, recorders will be monitored as specified in Section 41.3 of the NOD. All ARIA voice recorders will be configured according to table 61-9. The ARIA audio recorder will be operated at 1-7/8 ips. Prepass and post calibrations will be accomplished at 60 ips. Mission data will be recorded at 120 ips per tables 61-3 and 61-4.

61.4.5 ARIA WIDEBAND RECORDER CALIBRATIONS

ARIA wideband recorders will be calibrated according to ARIA PMC, TU-28319-1-2/RCDR.

Table 61-4. Tape Recorder No. 1

Track	Receiver	Link	Ant. Pol.	IF Filter	Demod	Video Filter	Type of Recording	Ref. Direct
1	Data G	2282.5	LH	3300 kHz	Phase	Direct	Receiver output direct	100 kHz
2	Data A	245.3	H	300 kHz	MBFM	25 kHz	900-kHz pre-D	
3	Track 2	2287.5	LH	3300 kHz	Phase	Direct	SSD output on 900-kHz FM	
4	Data A	245.3	Comb.	300 kHz	MBFM	25 kHz	Combined 900-kHz pre-D	
5	Track 4	2287.5	RH	3300 kHz	Phase	Direct	SDD output on 900-kHz FM	
6	Data A	245.3	V	300 kHz	MBFM	25 kHz	900-kHz pre-D	
7	Multi- plexer 1						900-kHz FM	
8	Multi- plexer 2						900-kHz FM	
9	Data B	250.7	H	500 kHz	WBFM	50 kHz	900-kHz pre-D	
10	Data C	258.5	H	300 kHz	MBFM	25 kHz	900-kHz pre-D	
11	Data B	250.7	Comb.	500 kHz	WBFM	50 kHz	Combined 900-kHz pre-D	
12	Data C	258.5	Comb.	300 kHz	MBFM	25 kHz	Combined 900-kHz pre-D	
13	Data B	250.7	V	500 kHz	WBFM	50 kHz	900-kHz pre-D	
14	Data C	258.5	V	300 kHz	MBFM	25 kHz	900-kHz pre-D	

Note

Run recorders at 120 ips

Table 61-5. Tape Recorder No. 2

Track	Receiver	Link	Ant. Pol.	IF Filter	Demod	Video Filter	Type of Recording	Ref. Direct
1	Data G	2282.5	RH	3300 kHz	Phase	Direct	Receiver output direct	100 kHz
2	Data D	258.5	H	300 kHz	MBFM	25 kHz	900-kHz pre-D	
3	Track 1	245.3	H	100 kHz	NBFM	25 kHz	900-kHz pre-D	
4	Data D	258.5	Comb.	300 kHz	MBFM	25 kHz	Combined 900-kHz pre-D	
5	Track 3	245.3	V	100 kHz	NBFM	25 kHz	900-kHz pre-D	
6	Data D	258.5	V	300 kHz	MBFM	25 kHz	900-kHz pre-D	
7	Multi-plexer 1						900-kHz FM	
8	Multi-plexer 2						900-kHz FM	
9	Data E	246.3	H	300 kHz	MBFM	50 kHz	900-kHz pre-D	
10	Data F	253.8	H	300 kHz	MBFM	50 kHz	900-kHz pre-D	
11	Data E	246.3	Comb.	300 kHz	MBFM	50 kHz	Combined 900-kHz pre-D	
12	Data F	253.8	Comb.	300 kHz	MBFM	50 kHz	Combined 900-kHz pre-D	
13	Data E	246.3	V	300 kHz	MBFM	50 kHz	900-kHz pre-D	
14	Data F	253.8	V	300 kHz	MBFM	50 kHz	900-kHz pre-D	

Note

Run recorder at 120 ips

Table 61-6. Tape Recorder No. 1 for Reentry

Track	Receiver	Link	Ant. Pol.	IF Filter	Demod	Video Filter	Type of Recording	Ref. Direct
1								100 kHz
2	Data A	243.0	H	100 kHz	MBFM	12.5 kHz	450-kHz pre-D Unlimited	
3	Track 2	2287.5	LHC	3.3 MHz	Phase	Direct	SDD output on 450-kHz FM	
4	Data A	243.0	Comb.	100 kHz	MBFM	12.5 kHz	Combined 450-kHz pre-D unlimited	
5	Track 4	2287.5	RHC	3.3 MHz	Phase	Direct	SDD Output on 450-kHz FM	
6	Data A	243.0	V	100 kHz	MBFM	12.5 kHz	450-kHz pre-D Unlimited	
7	Multi-plexer 1						450-kHz FM	
8	Multi-plexer 2						450-kHz FM	
9								
10								
11								
12								
13								
14								100 kHz

Notes

1. Run recorders at 60 ips.
2. Tracking receivers 1 and 3 must be operated with 100-kHz IF filters to track link 243.0. Record SS of these receivers on Multiplexer 2 even though no data output recordings are required.
3. Recorder number 2 will be configured as backup for recorder number 1.

Table 61-7. Multiplexer No. 1 Setup

Data	VR/ Pol.	Tape Rcdr/Tk	IRIG Channel	SCO Freq.	Remarks
100 pps Code/1 kHz			E	70W	IRIG-B/1 kHz
Voice Annotation			16	40	
2 pps Code			15	30	IRIG-C
SS	2/L	1/3	14	22	
SS	4/R	1/5	13	14.5	
SS	A/H	1/2	12	10.5	
SS	A/V	1/6	11	7.35	
SS	B/H	1/9	10	5.4	
SS	B/V	1/13	9	3.9	
SS	C/H	1/10	8	3.0	
SS	C/V	1/14	7	2.3	
SS	G/L	1/1	5	1.3	
SS	G/R	2/1	4	0.96	
Timing Alarm			1	0.40	

Table 61-8. Multiplexer No. 2 Setup

Data	VR/ Pol.	Tape Rcdr/Tk	IRIG Channel	SCO Freq.	Remarks
100 pps Code/1 kHz			E	70W	IRIG-B/1 kHz
Voice Annotation			16	40	
2 pps Code			15	30	IRIG-C
SS	1/H	2/3	14	22	
SS	3/V	2/5	13	14.5	
SS	D/H	2/2	12	10.5	
SS	D/V	2/6	11	7.35	
SS	E/H	2/9	10	5.4	
SS	E/V	2/13	9	3.9	
SS	F/H	2/10	8	3.0	
SS	F/V	2/14	7	2.3	
Timing Alarm			1	0.40	

Table 61-9. Voice Recorder Configuration for all ARIA

Track	Signal
1	IRIG B on 1 kHz
2	PMEE IC
3	VHF verification receiver
4	S/C and HF relay
5	USB combined downlink
6	VHF combined downlink
7	Order wire #1

61.4.6 RECEIVERS

Receivers will be calibrated as detailed in the "Pre-mission Calibration Manual", TU-28319-1-2. Before each data recording interval, receivers will be adjusted as specified in Section 41.3 of the NOD. Subsequent actions will be as follows:

- a. Record the limited pre-D output of each individual receiver channel on tapes. Feed combiners from unlimited receiver outputs.
- b. Use a 1-millisecond AGC response on all telemetry receivers. Use VHO for VHF telemetry receivers in second LO mode. (Do not use AFC.)
- c. Perform the receiver input patching as follows:

<u>Receiver</u>	<u>Frequency Band</u>	<u>Channel</u>	<u>No.</u>	<u>Polarization</u>
TR-109	UHF	1	All	RHC
TR-109	UHF	2	All	LHC
TR-109	VHF	1	All	V
TR-109	VHF	2	All	H
MR-109	VHF	Sum	1	H
MR-109	UHF	Sum	2	LHC
MR-109	VHF	Sum	3	V
MR-109	UHF	Sum	4	RHC

- d. Set up receivers on PM links 2287.5 MHz and 2282.5 MHz as follows:

2nd LO mode	-	APC
Loop control	-	Long
Loop bandwidth	-	1000 Hz
Anti-sideband	-	Off
Acquisition mode	-	Automatic*
AGC	-	Coherent

*Note

Manual operation will be used when uplink transponder lock is attempted before obtaining tracking receiver PM demodulation lock on 2287.5. After uplink lock has been achieved, return to automatic mode.

61.4.7 ANTENNA POLARIZATION

Instrumentation antenna polarization will be as follows:

- a. Linear polarization will be used for all VHF telemetry and voice reception.
- b. Right hand circular (RHC) polarization will be used for all VHF voice uplink (transmit).

- c. RHC polarization will be used for all UHF (S-band) transmit.
- d. Circular polarization will be used for all UHF (S-band) receive.

61.4.8 ANTENNA POSITIONING

61.4.8.1 Instrumentation Antenna. The instrumentation antenna will be positioned and operated according to Section 41.3 of the NOD, the Instrumentation Almanac, or acquisition messages as appropriate.

61.4.8.2 Antenna Beam Tilt. Acquisition for all ARIA (except for reentry support) will be according to H-30 procedures modified as follows:

- a. Select the VHF/UHF optimum mode and acquire VHF autotrack.
- b. Acquire UHF autotrack and switch to UHF optimum as soon as UHF track stabilizes (combiner is not switching between UHF and VHF).
- c. When stable UHF autotrack has been achieved and antenna elevation is 2 degrees or more above horizontal, insert VHF beam tilt in accordance with the following schedule shown in table 61-10.

Table 61-10. Beam Tilt Schedule

Beam Tilt	Time From PCA (min:sec)		
	TSP A	TSP B	TSP C
20 Deg	*	*	*
16 Deg	-02:15	-02:15	-01:52
11 Deg	-01:50	-01:50	-01:31
0 Deg	-01:25	-01:25	-01:09
11 Deg plus	+01:25	+01:17	+01:41
16 Deg plus	+01:50	+01:43	**
20 Deg plus	+02:15	+02:07	**
0 Deg plus	+03:35	+03:22	+02:30

*As soon as a trackable S-band signal is received

**For TSP C, 11 degrees will be selected at plus 01:41 and maintained until plus 02:30 when 0 degrees will be selected

Note

This schedule is referenced to PCA, in minutes and seconds, to accommodate real-time changes in S/C trajectory or aircraft position. Every effort should be made to execute beam tilt within 1 second of the specified time.

d. When receiving VHF voice and no VHF telemetry links are present, use the procedure described in subparagraph c.

61.4.9 ARIA SIGNAL DATA DEMODULATORS

The signal data demodulators (USB demodulators) are to be set up as follows:

Loop bandwidth: 1500-Hz position/750-Hz position

Bit rate: 51.2 kbps /1.6 kbps

Note

Special operating instructions for the SDD are contained in ARIA Inflight Procedures, TU-28319-1-2.

61.4.10 ARIA TAPE RECORDER LABELS

ARIA tape recorder labels will be provided according to the "AFETR Range Operating Instruction" (ROI) 45-23-04-02.

61.4.11 VOICE ANNOTATION OF WIDEBAND RECORDERS

Wideband recorder tapes will be voice annotated in accordance with Section 35.3.4.1 b of the NOD. If the required information cannot be placed on the data tape, it will be annotated on the calibration tape, and the following will be annotated on data tape:

NCG No. _____
ETR Test No. _____
Date _____
TSP No. _____
ACFT Tail No. _____
Recorder No. _____

61.4.12 POSTMISSION S-BAND VOICE CALIBRATION TEST

Upon completion of mission support, each ARIA will perform the following test and will teletype results to the AOCC. This data is required at the AOCC within 2 days after the last TSP is supported:

a. Equipment Setup

(1) Patch the following:

- (a) UHF/VHF signal generator to directional couplers through step attenuator
- (b) SDD outputs (one at a time at video patchpanel) to distortion analyzer (HP 331) set for rms voltmeter operation.

(2) Set UHF/VHF signal generator controls as follows:

Output freq: 2287.5 MHz
 Mod level: 0.7 radians
 Carrier mod: 1.25 MHz
 Freq select: 2200 - 2300 MHz
 Video gen: 400-Hz sine wave
 Modulation mode: PM

b. Test Procedure. Make RMS voltage readings of SDD output using the following receiver input signal levels with video Mod SW on and off. Video Mod on represents signal plus noise (S+N) and Mod off represents noise (N).

c. Test Data. Record RMS voltage as follows:

Signal Level dbm	SDD No. 1		SDD No. 2	
	S + N	N	S + N	N
-80				
-90				
-100				
-105				
-110				
-115				
-120				

d. Test Data Identification. Identify test data as follows and teletype it to the AOCC:

ARIA No. _____
 Date of Test _____
 ARIA S-band Voice Calibration Data

61.4.13 CONTINGENCY RECOVERY SUPPORT

Each ARIA will carry crystals for link 243.0 MHz and two 100-kHz IF filters to be used in the VHF tracking receivers during a contingency recovery situation.

61.5 MISSION DATA

61.5.1 DATA RECORDING

The following data will be recorded onboard each aircraft:

- Wideband magnetic tapes (TLM) - two per aircraft/TSP
- Narrowband magnetic tapes (voice) - one per aircraft/day

c. AFETR Form 40 - one per aircraft/TSP - which contains:

- (1) Airborne telemetry log (ARIA configuration setup)
- (2) ARIA pre/post calibration procedures
- (3) Mission coordinator's quicklook report
- (4) Navigation log (including navigator's plot of flight profile)
- (5) Telemetry support summary
 - (a) Antenna operator's data/log
 - (b) Voice operator's data/log
 - (c) Telemetry operator's data/log
 - (d) HF operator's data/log
 - (e) Recorder operator's data/log.

61.5.2 DATA PROVIDED BY AFETR

The following data will be provided by the AFETR:

- a. Instrumentation almanac
- b. Voice recordings (HF-1 and HF-2) from Cape XY Building
- c. Permission BER test data tapes from PMC
- d. ARIA controller's report (including ground communicator evaluation report)
- e. PLIM data sheet
- f. ARIA/AOCC detailed performance report.

61.5.3 DATA HANDLING

ARIA data will be handled according to Section 35 of the NOD.

Supplement to Section 62

Ship Support

SUPPLEMENT TO SECTION 62. SHIP SUPPORT

62.1 APOLLO INSTRUMENTED SHIP (AIS) TEST SUPPORT POSITIONS

To be provided by Prepermission Documentation Change (PDC) or Instrumentation Support Instruction (ISI)

62.2 SHIP POSITION AND ATTITUDE MEASURING SYSTEM (SPAMS)

62.2.1 MISSION PROCEDURES

All SPAMS procedures in the NOD, except Bathymetric Navigation System (BNS) procedures, apply for the AS-506 Mission.

62.2.2 EQUIPMENT OPERATING PROCEDURES

62.2.2.1 Loran-C. Whenever ships are located where use of Loran-C equipment is possible, it is to be used. All ships are to report the status of Loran-C data in the Navigation Data Message (NDM); however, if the equipment is unusable due to location of the ship, report this only once in the NDM.

62.2.2.2 Sonar Transponder (VAN only). Two transponders will be dropped and surveyed using procedures outlined in Section 62.4 of the NOD. The sonar beacon drop and survey will start at least four days prior to T-0. Transponders will be released to the surface by acoustic command upon completion of mission support; backup release timers will be set for thirteen days. Position data obtained from transponders will be used as the preferred reference to update the Integrated Navigation System (INS) in case of failure of the Marine Star Tracker, or an overcast sky.

62.2.2.3 Satellite Tracker (AN/SRN-9). The computer interface to the Central Data Processor (CDP) is not operational for this mission; data must be taken from the thermal printer and transcribed to the data entry sheet before it is entered into the CDP and the Input/Output (I/O) console. Prior to use of AN/SRN-9 position fixes in calculating an INS 3-fix reset, AN/SRN-9 data will be recorded and reduced to determine confidence level. This is accomplished by comparing position-fix data obtained by the AN/SRN-9 with data obtained by the Marine Star Tracker. A suitable confidence level is one-quarter of a nautical mile or less. After suitable confidence level is established, AN/SRN-9 position fixes can be used for INS 3-fix reset calculation, if the data can be obtained and reduced within thirty minutes from the time of the last AN/SRN-9 position fix.

62.2.3 CONTINGENCY PROCEDURES

62.2.3.1 Contingency Equipment Usage. Contingency equipment usage for all class ships is as follows:

<u>Use</u>	<u>Position Equipment</u>	<u>Attitude Equipment</u>
Primary	INS	INS
Secondary	Dead Reckoning	MK-19
Backup	SRN-9	
Backup	Loran-C	

Note

Primary and secondary modes are selectable only by the Local Discrete Control Panel (LDCP) operator in the computer room. The backup position modes are not selectable; they are used only to update the primary or secondary source.

62.2.3.2 INS Updating. If star data is not available for INS updating: VAN will use the BNS sonar transponders (preferred), or the AN/SRN-9; MER/RED/HTV will use the AN/SRN-9. All ships will use the Loran-C equipment for INS updating only if the aforementioned sources are not available.

62.2.3.3 Flexure Monitor Failure. In the event of Flexure Monitor failure, the Analog/Digital (A/D) converter and encoder power supplies for the appropriate Flexure Monitor should be turned off. This will provide an all-zero input to the Flexure Monitor Buffer (CDP). The CDP operator on class 19 ships will continue to use the roll-path misalignment constants (the Flexc/Flexc entry in the ACQ/Trk program).

62.2.3.4 6-Point Acquisition Message Plotting. The navigation data plotter will plot the 6-point acquisition message and will determine if a change in ship's course is necessary. This information is given to the navigation coordinator who will inform the ship's controller if bow- or side-tracking will occur and will report the necessary course change. This is a backup function to the ship's controller who also plots the 6-point acquisition message. The plotting of the 6-points [Elevation (EL) and Azimuth (AZ)] will be done on a maneuvering plotting chart. This procedure will be repeated for each pass.

62.3 CDP SUPPORT

62.3.1 CLASS 19 SHIPS

62.3.1.1 CDP Usage. The CDP and associated equipment will be used to:

- a. Process navigation data from ship navigation section
- b. Provide acquisition data to the ship antennas on the computer bus, and through the Acquisition and Stabilization Network (ASN) and direct digital designate, to C-band radar and USB
- c. Record C-band radar, USB, and navigation data on the Raw Data Recorder (RDR)
- d. Record C-band radar, USB, and navigation data
- e. Provide C-band radar and/or USB teletype data for real-time transmission to the Manned Spacecraft Center (MSC)
- f. Provide high-speed C-band radar and USB data for real-time transmission to MSC
- g. Progress C-band radar and USB data to provide displays to the Maintenance and Operations Supervisor (M&O) and printout of M&O digital display events on CDP high-speed printer.

62.3.1.2 General CDP Instructions

- a. CDP diagnostics and Station Readiness Tests (SRTs) will be conducted as required.
- b. For all scheduled passes, the CDP will initiate error models from the standby program at H-50 minutes. The CDP will print out the error model data on the I/O console and a copy of the data will be provided to the navigation section. At H -20 minutes, the CDP will be switched from standby to the acquisition track mode.
- c. Raw C-band radar and USB data will be received via the USB and C-band radar buffers as inputs for the CDP. The raw C-band radar, USB, and navigation data will be recorded on the Raw Data Recorder (RDR). Raw and corrected C-band radar and USB data will be recorded on CDP 1240 magnetic tape unit during all scheduled passes. Magnetic tapes and high-speed printer tabouts will be annotated with test number, date, time, and revolution number.

62.3.1.3 CDP Instruction (Insertion Phase)

- a. Insertion ship will not receive an inflight Interrange Vector (IRV) message for the insertion phase. A nominal IRV message, provided before launch, will be the prime source of acquisition. Nominal look angles, inserted by use of handwheels, and "DESAE" routine in the ACQ/Trk Program will be used as the backup acquisition source. AZ and EL of input data are provided in degrees and range is provided in feet. In the acquisition track mode the CDP will stabilize this data by means of the ASN for acquisition by all ship antennas.
- b. From Acquisition of Signal (AOS) to Loss of Signal (LOS) the CDP will transmit high-speed real-time C-band radar and USB data to MCC via high-speed data transmission system.
- c. The CDP will transmit USB Telemetry (TTY) data in real-time to Mission Control Center (MCC) from AOS to LOS of S-band track. This data will be transmitted at 100-words per minute in the 60-character format at a rate of one sample per six seconds. C-band radar TTY data will be transmitted postpass to MCC. The priority may be modified by the tracking schedule or Site Configuration Message (SCM).
- d. The CDP computer is also required to accept the following manual inputs:
 - (1) Liftoff time in GMT (GMTLO)
 - (2) Mission Identification (ID) for TTY and Data Transmission Unit (DTU) data transmission
 - (3) Ships position for TTY metric data transmission
 - (4) Radar corrections for C-band radar
 - (5) Radar corrections for S-band
 - (6) INS biases, navigation data biases

- (7) Flexure biases
- (8) Ship's position for dead reckoning
- (9) Satellite Communications (SATCOM) designate data in nautical mile XYZ format and AZ and EL angles format
- (10) IRV manual insertion by means of I/O console.

e. The LDCP thrusting switch will normally be in the ON position. The thrusting switch will be turned off as directed by Track after insertion.

62.3.1.4 CDP Instruction (Earth Orbital Phase)

a. After the initial insertion revolution, IRV and 6-point acquisition messages will be sent from MCC, 30 to 60 minutes before every scheduled pass. The hard copy of the IRV message will be evaluated for the correct range address(es) and number of characters per line. Checksums will be verified and the time, position, and velocity parameters will be checked before loading the IRV message into the CDP. The format of the IRV message is shown in Section 33 of the NOD. The IRV will be used in the acquisition mode of the CDP operation program to provide acquisition data to the computer acquisition bus. In the acquisition track mode, the CDP will also provide stabilization data for the ASN. The MCC 6-point acquisition message format is shown in Section 33 of the NOD. Ships will also receive 20-second look angles from Goddard Space Flight Center (GSFC). If the MCC IRV is invalid, the Acquisition Bus Monitor (ABM) will have look-angle data inserted by use of hand-wheels. The CDP will stabilize these look angles for all ship antennas by using the ASN. CDP personnel will also insert the look angles vs time data by means of the "DESAE" routine in the ACQ/Trk Program. AZ and EL are provided in degrees; range is provided in feet.

b. The CDP will output S-band data in real time at 100-words per minutes in the 60-character format at a rate of one sample per six seconds. C-band radar data will be transmitted postpass. (The priority may be modified by the tracking schedule or SCM.)

c. LDCP thrusting switch is set to OFF position, or as directed by Track.

62.3.1.5 CDP Metric Data Reduction, Analysis, or Evaluation. Requirements for CDP metric reduction, analysis, or evaluation will be provided by PDC or ISI.

62.3.2 CLASS 6 SHIPS

To be supplied.

62.4 SHIPBOARD TIMING

The timing requirements and distribution of timing signals are shown in table 62-1. Timing propagation delays for timing system synchronization will be issued by PDC or ISI prior to the mission.

62.5 SHIPBOARD WEATHER REPORTING

Shipboard weather reporting will begin at F -5 days and will be accomplished in accordance with paragraph 62.3.5 of the NOD.

Table 62-1. Shipboard Timing Requirements Signal Distribution

Timing Signal	TLM	USB		OCC	CMD	Comm	C-band	Xmitters	Navigation	Computers	Comments
IRIG A											1 K pps*
IRIG B	1						1		1		100 pps*
IRIG C	1			1	1		1				2 pps*
IRIG D											1 ppm*
IRIG E											10 pps*
NASA 1 sec	1										*
NASA 1 min											*
NASA 1 hr											*
NASA SDT	2										*
5 MHz											**
1 MHz		8				6		1	1		**
100 MHz		2							1	7	**
1 Mpps											**
2 Mpps											**
10 kpps										2	**
1 kpps											**
100 pps									1		**
60 pps											**
40 pps										6	**
20 pps										6	**
10 pps					1					6	**
2 pps											**
1 pps				1							**
10 ppm											**
2 ppm									1		**
Binary coded generator										8	*

*Coded

**Not coded

Note

The numbers indicate the number of lines required. One of the SDT signals going to TLM will be on 1 kHz.

62.6 RECOVERY SUPPORT CONTINGENCY

62.6.1 The USNS Vanguard is designated as a secondary recovery ship to support launch abort contingencies in addition to its primary assignment of tracking.

62.6.2 In the event of an abort during the ascent phase of the mission, the Recovery Coordinator at MCC will determine the need for VAN to support recovery operations. Following such a decision, responsibility for issuance of instructions to VAN passes from the Flight Director to the Commander, Task Force 140 (CTF-140), located at the Atlantic Recovery Control Center, Norfolk, Virginia.

62.6.3 The Recovery Coordinator will notify the Network Controller (NC) that a voice circuit is required between CTF-140 and the bridge of the ship. The NC will request GSFC to extend a circuit to VAN.

62.6.4 After initial communications have been established, VAN will enter the Task Force Recovery Common HF-SSB net for communications with CTF-140 in accordance with appropriate frequency plans. Local communications between VAN, HC-130 aircraft, the Command Module, and pararescue personnel will be conducted on 296.8 MHz link. Release of the recovery circuits will be made by CTF-140.

62.6.5 During a recovery situation, a running commentary of significant events will be made to CTF-140.

62.6.6 VAN is required to submit surface weather observations to MCC as outlined in paragraph 62.3.5.3 of the NOD.

62.7 SHIP/APOLLO RANGE INSTRUMENTATION AIRCRAFT (ARIA) DATA TRANSFER (MER/RED)

62.7.1 PURPOSE

The purpose of the data transfer is to provide rapid delivery of important Translunar Injection (TLI) data to Marshall Space Flight Center (MSFC). The tapes recorded on the aircraft will be delivered to a courier aircraft for immediate delivery to MSFC.

62.7.2 METHOD

Telemetry data, recorded on the ship during the TLI phase is transmitted from the ship to the aircraft using S-band. The aircraft will receive the data, record it on tape, and deliver the tape to the user as rapidly as possible.

62.7.3 OPERATING PROCEDURES

The aircraft will approach the ship on a radial pattern. When VHF voice contact is established, the ship S-band transmitter will be brought up with modulation. The modulation source will be a tape, copied from the mission tape recorded during the TLI pass. When the aircraft has established recording levels and is ready to record, the ship will rewind the tape to the beginning of the data and will stand by to start the transfer. The tape will be started on command of the aircraft. If there is insufficient time remaining to complete the transfer, the aircraft should be instructed to start the run over. Three full data passes will be required to transfer all the data. During each pass, one Pulse Code Modulation (PCM) link will be transmitted on the 1.024-MHz subcarrier, one FM/FM link will be transmitted using the 450-kHz carrier from the tape recorder, and the timing track must be repeated. The ship should monitor the tape during the playback to report dropouts on the tape to the aircraft to avoid unnecessary reruns.

62.7.4 SEQUENCE OF EVENTS

<u>Sequence</u>	<u>Position</u>	<u>Event</u>
1	M&O	Establish equipment configuration and perform loop-back test.
2	M&O/ ARIA	Establish HF contact at approximately 500 miles (approximately one hour prior to data transfer).
3	M&O/ ARIA	Establish voice contact on 296.8-MHz link. Check secondary link, 259.7 MHz, and return to 296.8-MHz link.
4	ARIA	Turn on dump transmitters 245.3 MHz primary link, and 237.8 secondary link.
5	M&O	Confirm autotrack of 4-1 antenna
6	ARIA	Confirm ARIA is on Test Support Position (TSP), and request ship to transmit on 2282.5-MHz link.
7	M&O	Turn test transmitter on and instruct ARIA that data will be uplinked for this pass.

<u>Sequence</u>	<u>Position</u>	<u>Event</u>
8	ARIA	Confirm autotrack. Request data for setup.
9	M&O	Start tape (use the portion of the tape with good data for this setup period).
10	ARIA	Confirm that all data is good, or request setup change. Request ship to rewind data for start of data run.
11	M&O	After data tape is rewound, confirm ARIA has sufficient amount of time remaining on TSP and good signal level.
12	M&O/ ARIA	Start data run. If at any time during the data run the ARIA has loss of data, the run should be aborted.
13	M&O	Instruct ARIA when transfer is complete.

62.7.5 DETAILED M&O PROCEDURES

The sequence of events in paragraph 62.7.4 outlines the procedures required of M&O. In addition, the aircraft requires range and bearing readings at one-minute intervals. These position points should be transmitted to the aircraft without request and without acknowledgement. Prior to the acquisition of the aircraft, the ship should establish the equipment configuration and perform an onboard loop-back test to confirm the validity of the setup. The M&O must determine the duration of the TLI pass to ensure that the entire data tape will be recorded. The pass duration should be reported to the aircraft prior to the run. Passes 1 and 2 have top priority in the event of time limitations. Prior to each pass, detailed information regarding the data to be transferred should be forwarded to the aircraft. Link identification should be reported by frequency and number, e.g., CP-1, DP-1, etc.

62.7.6 DETAILED TLM PROCEDURES

62.7.6.1 Preparation. The data pass from TLI will be copied as soon after the mission as possible (copy should be complete by TLI plus two hours). The only data required to be copied is DP-1, track 11; CP-1, track 6; DP-1B, track 7; DF-1, track 8; and track 12; 36-Bit Timing, track 5; USB Mixer plus Cycle Lock, track 10. The best quality tape copy possible should be made. All Saturn Launch Vehicle (SLV) data should be copied in an FM mode (even if the original data is recorded direct). The 36-bit Binary Coded Decimal (BCD)/1-kHz Timing and Cycle-Lock data should be copied direct.

62.7.6.2 Transfer Configuration. The PCM data (DP-1, CP-1, and DP-1B) will be patched from the tape recorder to the PCM station. The signal conditioner output will be patched to the S-band area where it will modulate the 1.024-MHz subcarrier. The FM/FM data (DF-1) will be patched from a direct reproduce output of the tape recorder on a 450-kHz carrier to the S-band area where it will modulate the S-band test transmitter. The timing data will be patched from the Phase Modulation (PM) reproduce output of the tape recorder (Track 5) to the S-band area where it will modulate the 1.25-MHz subcarrier. The recorder output for timing data should be adjusted to approximately 3 vpp. Cycle Lock should be used for all phases of the transfer.

62.7.6.3 Transfer Procedures. Prior to each run, Telemetry Operator (TLM) will inform M&O of the link frequency and link number (CP-1, DPA-1, etc.) to be transferred.

a. Telemetry Antenna 4-1. The antenna will track the ARIA on 245.3-MHz (unmod) (primary), and 237.8-MHz (secondary). The main function of the antenna is to provide the acquisition source for the ARIA S-band antenna.

b. Tape Recorder. Prior to each data run, the data will be uplinked for a short period to allow ARIA to set levels. After ARIA has reported a good signal level setting, the data tape will be rewound to the AOS point for the data run. During the data runs, the PCM station should be monitored to ensure that the signal conditioner is properly adjusted. There will be three data runs. The data for each run will be transmitted as follows:

(1) Run 1

<u>Data</u>	<u>Track No.</u>
DP-1B	7
DF-1	8
Timing	5

(2) Run 2

<u>Data</u>	<u>Track No.</u>
CP-1	6
DF-1	12
Timing	5

(3) Run 3

<u>Data</u>	<u>Track No.</u>
DP-1	11
Timing	5

c. Data Verification. During the data run, the loop-back data should be checked as follows:

(1) PCM Data. Check PCM data received from the USB area by placing data on a second decom. This decom should not have more dropouts than the decom being used to feed the USB.

(2) FM/FM Data. Check the FM/FM data by patching the composite output of USB to an FM reproduce unit of a tape recorder. The output of the FM reproduce unit can be observed on the TMI.

(3) Timing. Check the timing data in the S-band area by monitoring the output of the 1.25-MHz demod on a scope.

62.7.7 DETAILED S-BAND PROCEDURES

- a. Coordinate patching with TLM so that signals received from them will be as follows:

<u>Function</u>	<u>Level</u>	<u>External Input SDDS</u>
Timing	3 vpp	Voice
PCM	2.5 vpp	TLM
450 kHz	6 vpp	Speech

- b. Patch the timing input to the voice subcarrier modulation input (1.25 MHz). Timing level should be set to 3 vpp.
- c. Patch the PCM input to TLM bias (1.024 MHz) input. The PCM level should be set to 2.5 vpp.
- d. Patch the voice subcarrier to the voice-subcarrier adder input. Patch the TLM subcarrier to the TLM subcarrier adder input.
- e. Patch the speech external input to speech-subcarrier adder input. The 450-kHz level should be set to 6 vpp.
- f. Connect the PM mod output to the video amp (HP 467A). Connect output of amp to TLM input of the test transmitter.
- g. The modulation indices will be set as follows:
- (1) TLM 1.024 MHz: 1.0 RAD
 - (2) Voice 1.25 MHz: 0.7 RAD
 - (3) 450-kHz FM/FM: 1.0 RAD
- h. Disconnect the TLM and voice subcarriers from the test transmitter. Use the video amp to set the carrier suppression on the 450-kHz FM/PM.
- i. Disconnect 450-kHz subcarrier and connect the voice and TLM subcarriers one at a time. Set the carrier suppression using internal level controls in the test unit.
- j. Tune test transmitter to 2282.5 MHz.

Note

Disconnect the paramp RF test inputs. Terminate the open inputs in 50-ohm load.

- k. Connect the output of the test transmitter through a Traveling Wave Tube (TWT) (Alfred 561A) to the test signal cable.
- l. Break the test signal line at the pedestal base bandpass filter. At this point insert another TWT (Alfred 6868) (Refer to note 1).
- m. Break the test-signal line again at the hub bandpass filter. Connect a test cable from there to the horn (Refer to note 2).

Note

1. Do not overdrive and saturate the TWT in the pedestal base. Establish an input of one milliwatt to the second TWT.
2. Fabricate a mounting bracket that will mate a horn with the spare acquisition antenna mount. Mount horn as close as possible in line with main antenna.
3. Establish a power input of one watt to the test horn.

62.7.8 RADAR PROCEDURES

The C-band radar will skin track the aircraft and will provide azimuth and range readouts at one-minute intervals. These readouts will be transmitted directly to the aircraft, or through the M&O. By direction from the M&O, the radar can also be used as an acquisition source for USB.

62.7.9 COMMUNICATION FREQUENCY

VHF

296.8-MHz primary: both ships

259.7-MHz secondary: both ships

HF

Recommended TX/RX frequencies in order of preference
(lower sideband operation)

<u>Mercury</u>		<u>Redstone</u>	
<u>Receive</u>	<u>Transmit</u>	<u>Receive</u>	<u>Transmit</u>
4747 kHz	4016 kHz	9022 kHz	9949 kHz
5688 kHz	5086 kHz	6732 kHz	7611 kHz
5703 kHz	5171 kHz		

The Network Support Team (NST) will coordinate any deviation from the aforementioned frequencies with the ships and ARIA prior to ARIA take off.

62.8 APOLLO SHIPS NAVIGATION DATA MESSAGE

Refer to paragraph 33.2.21 of the NOD for Apollo Ships NDM sample format. Text explanations are as follows:

- a. Items 1-17. Refer to paragraph 33.2.21.5b. of the NOD.
- b. Item 18. Item 18 of the NDM will contain the time of all resets since transmission of the previous NDM and the code assigned to the method used for each reset.
- c. Items 19-24. Refer to paragraph 33.2.21.5b. of the NOD.
- d. Item 25. Item 25 of the NDM will contain the most recent problems, status of the navigation area, percentage of cloud cover, star-tracking status, and sea condition.

